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**THE MECHANICAL PROPERTY DATA BASE FROM AN
AIR FORCE/INDUSTRY COOPERATIVE TEST PROGRAM ON HIGH
TEMPERATURE ALUMINUM ALLOYS**

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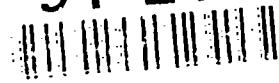
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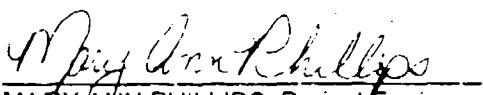
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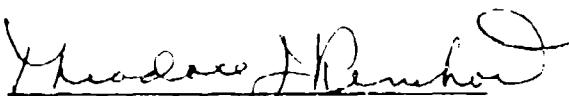
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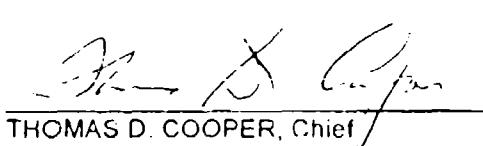
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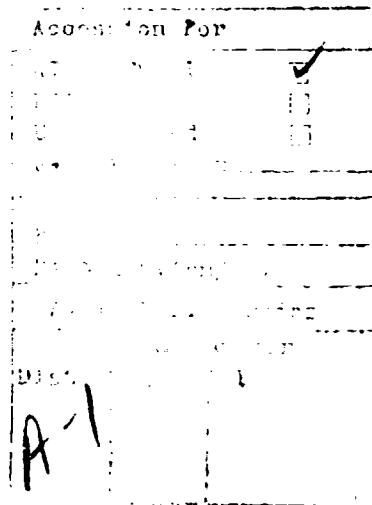
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<p>A mechanical property data base on high temperature aluminum alloys produced by Allied Signal (8009 sheet and extrusion) and Alcoa (CZ42 sheet and extrusion, 8019 extrusion) was generated. Mechanical property data consisted of tension, compression, shear, bearing, and fracture toughness values. Fatigue, fatigue crack growth rate, and spectrum fatigue crack growth rate data were generated.</p>										
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PREFACE

This report was prepared by the Materials Engineering Branch (WL/MLSE), Systems Support Division, Materials Directorate, Wright Laboratory, Wright-Patterson Air Force Base, Ohio, under Project 2418, "Metallic Structural Materials," Task 241807, "Systems Support," Work Unit 24180703, "Engineering and Design Data."

The authors would like to thank the participants General Dynamics TX, General Dynamics CA, McDonnell Douglas MO, McDonnell Douglas CA, NASA-Langley VA, Northrop CA, Army MA, Rohr Industries CA, and the Air Force.

SECTION 1

INTRODUCTION

High performance aerospace systems are dependent on materials that are lighter, have improved mechanical properties, have a potential for use at elevated temperatures, and/or offer a cost savings. Aluminum alloys that met these criteria were the newly developed high temperature aluminum alloys.

In 1989, the Air Force along with the aerospace community found it important to investigate the potential of these promising aluminum alloys. A cooperative program was formed by the Wright Laboratory Materials Directorate, Systems Support Division, and a number of aerospace industries. The Air Force would obtain the test material from the producers, compile the test data, and submit a report to the participants. The participants agreed to support the program by performing mechanical property tests which includes tension, compression, bearing, shear, fracture toughness, and fatigue related properties (S/N, da/dN). The Air Force elected to perform spectrum fatigue crack growth rate testing on selected alloys. A list of participants is shown in the following table (Table 1).

This final report contains the high temperature aluminum alloys: 8009 (formerly known as FVS0812) Sheet and Extrusion produced by Allied Signal, CZ42 Sheet and Extrusion, and 8019 (formerly known as CU78) Extrusion produced by Alcoa. Comparisons to other materials and ranking of materials are generally avoided since each application may be based on different evaluation criteria.

TABLE 1. PARTICIPANTS AND ALLOYS IN THE COOPERATIVE TEST PROGRAM.

PARTICIPANTS	MATERIALS		ALLIED			ALCOA		
	FV50812 (8009) SHEET (0.09" x 24" x 48")	FV50812 (8009) EXTRUSION (1.0" x 4" x 48")	CZ112 SHEET (0.09" x 12" x 48")	CZ112 EXTRUSION (1" x 3" x 6")	CW18 (8019) EXTRUSION (1" x 2" x 6")			
Air Force, OH	X	X	X	X	X	X	X	X
Army, MA		X		X		X	X	X
Douglas Aircraft, CA	X	X						
General Dynamics Space Systems, CA	X	X	X					X
General Dynamics, TX	X							
McDonnell Douglas Space Systems, CA		X						
McDonnell Douglas Missile Systems, MO		X						
NASA, VA	X	X	X	X	X	X	X	X
Northrop, CA	X	X	X	X	X	X	X	X
Rohr, CA	X							

SECTION 2

MATERIALS AND TESTS

The Allied Signal high temperature aluminum alloys 8009 0.09 inch x 24 inch x 48 inch sheet and 8009 1 inch x 4 inch x 48 inch extrusion were received during 1990, the sheet material arriving in February and July and the extrusions in the Fourth Quarter. The Alcoa high temperature aluminum alloys were received on various dates: CZ42 0.09 inch x 12 inch x 48 inch sheet September 1991, CZ42 1 inch x 3 inch x 72 inch extrusion April 1991, and 8019 1 inch x 3 inch x 72 inch extrusion April 1991.

The 8009 alloys were tested by all of the participants as marked by an "X" in Table 1. The CZ42 sheet was tested by General Dynamics CA and the Air Force. The CZ42 and 8019 extrusions were tested by the Army and Air Force.

All testing (tension, compression, shear, bearing, fracture toughness, fatigue, and fatigue crack growth rate) was performed in accordance with the appropriate ASTM standards, unless otherwise specified.

Spectrum fatigue crack growth rate tests were performed by the Air Force using FALSTAFF (a severe fatigue environment) and Mini-TWIST (a moderately intense fatigue environment) spectrums.

SECTION 3

PRESENTATION

Each participant compiled a data package which contained the data they generated. Some of these data packages contain discussions, and in other cases, only the data were provided. The tensile, compression, shear, and bearing are in tabular form. Fracture toughness, fatigue, fatigue crack growth rate, and spectrum fatigue crack growth rate are shown in tabular and graphical form.

SECTION 4

RESULTS AND DISCUSSION

The data generated by the participants on the 8009 sheet, 8009 extrusion, CZ42 sheet, CZ42 extrusion, and 8019 extrusion are in the appendices. The following table lists the high temperature aluminum alloy, form, and the appendix where the data can be found.

TABLE 2
CONTENTS OF APPENDICES

<u>Alloy</u>	<u>Form</u>	<u>Appendix</u>
8009	Sheet	A
8009	Extrusion	B
CZ42	Sheet	C
CZ42	Extrusion	D
8019	Extrusion	E

SECTION 5

CONCLUSIONS

Ten aerospace laboratories participated in generating data on the 8009, CZ42, and 8019 high temperature aluminum alloys for the cooperative test program. These data provide an extensive data base on high temperature aluminum alloys.

APPENDIX A

8009 SHEET
0.09" X 24" X 48"

TABLE A1
TENSILE RESULTS FOR
ALLIED SIGNAL FVS0812 (8009) SHEET (0.090" THICK)

COMPANY	TEST TEMP (DEGREES F)	ORIENT-ATION	ULTIMATE STRENGTH (KSI)	YIELD STRENGTH (KSI)	ELONG (%)	RA (%)	E (MSI)		
GENERAL DYNAMICS, CA	RT	LONG	66.6	63.1	7.0		11.3		
			66.9	64.0	12.0		10.9		
			66.8	64.2	15.0		11.0		
MCDONNELL DOUGLAS	RT	LONG	62.6	59.5	9.0		11.3		
			66.5	64.3	9.0		10.8		
			67.2	65.3	7.0		11.1		
ROHR INDUSTRIES	RT	LONG	70.6	64.4	9.5		11.4		
			71.4	64.8	10.5		11.6		
			71.4	64.7	9.5		11.4		
GENERAL DYNAMICS, TX	RT	LONG	64.3	60.8	8.1		11.1		
			64.3		6.8		12.4		
			66.3	61.1	7.5		12.2		
			66.4	62.3	6.8		11.3		
			65.5	61.4	6.9		12.5		
			66.4	63.4	4.7		11.7		
			66.9	62.1	6.3		11.6		
MCDONNELL DOUGLAS, CA	RT	LONG	68.1	63.6	10.0		10.7		
			68.1	63.6	9.0		10.7		
			68.1	63.6	8.0		10.8		
AIR FORCE	RT	LONG	60.1	58.3	11.8				
			61.5	58.1	11.2				
			61.7	59.6	12.3				
NASA-LANGLEY	RT	LONG	71.5	62.0	16.0		12.2		
			71.5	62.0	16.0		12.2		
			71.7	62.0	16.0		12.4		
			74.5	63.0	16.0		12.2		
			72.0	63.0	17.0		12.1		
			70.6	64.0			12.2		
NORTHROP	RT	LONG	68.2	64.3	10.0		10.9		
			68.3	64.7	10.0		10.7		
			68.0	64.6	10.0		10.7		
AVERAGE			67.5	62.7	10.3		11.5		
STANDARD DEVIATION			3.4	1.9	3.4		0.6		

TABLE A2
TENSILE RESULTS FOR
ALLIED SIGNAL FVS0812 (8009) SHEET (0.090" THICK)

COMPANY	TEST TEMP (DEGREES F)	ORIPNT- ATION	ULTIMATE STRENGTH (KSI)	YIELD STRENGTH (KSI)	ELONG (%)	RA (%)	E (MSI)		
GENERAL DYNAMICS, CA	RT	L TRANS	65.8	61.2	17.0		11.0		
			65.8	61.6	10.0		10.7		
			65.6	63.8	10.0		11.3		
MCDONNELL DOUGLAS	RT	L TRANS	63.3	59.2	10.0		11.4		
			62.9	58.2	12.0		11.6		
			63.0	58.8	10.0		11.3		
ROHR INDUSTRIES	RT	L TRANS	71.7	60.9			11.5		
			72.1	61.4			11.7		
			72.5	62.8	8.5		12.2		
GENERAL DYNAMICS, TX	RT	L TRANS	63.4	56.1	6.3		12.4		
			62.2	55.3	10.9		11.6		
MCDONNELL DOUGLAS, CA	RT	L TRANS	70.4	64.1	8.0		10.9		
			68.8	62.5	7.0		10.9		
			69.5	63.0	7.0		11.3		
AIR FORCE	RT	L TRANS	60.0	55.7	15.8				
			60.3	56.2	13.5				
			60.5	57.2	14.3				
NASA-LANGLEY	RT	L TRANS	72.4	62.0			12.4		
			73.1	62.0	20.0		12.4		
			72.5	61.0	17.0		12.4		
			73.8	62.0	15.0		12.4		
			73.6	62.0			12.4		
			73.2	62.0			12.3		
NORTHROP	RT	L TRANS	67.4	62.6	12.5		10.4		
			66.9	62.0	10.0		10.6		
			67.0	61.6	12.0		11.4		
AVERAGE			67.6	60.6	11.8		11.6		
STANDARD DEVIATION			4.6	2.6	3.7		0.7		

TABLE A3
TENSILE RESULTS FOR
ALLIED SIGNAL FVS0812 (8009) SHEET (0.090" THICK)

COMPANY	TEST TEMP (DEGREES F)	ORIENT-ATION	ULTIMATE STRENGTH (KSI)	YIELD STRENGTH (KSI)	ELONG (%)	RA (%)	E (MSI)
MCDONNELL DOUGLAS, CA	300	LONG	56.4	53.2	5.0	4	9.6
			55.5	51.4	5.0		9.1
			56.7	54.1	5.0		9.6
NASA-LANGLEY	300	LONG	57.5	52.5			10.9
			59.1	53.0	9.0		11.1
			58.6	52.5			11.0
		AVERAGE	57.3	52.8	6.0		10.2
		STANDARD DEVIATION	1.4	0.9	2.0		0.9

TABLE A4
TENSILE RESULTS FOR
ALLIED SIGNAL FVSC812 (8009) SHEET (0.090" THICK)

COMPANY	TEST TEMP (DEGREES F)	ORIENT-ATION	ULTIMATE STRENGTH (KSI)	YIELD STRENGTH (KSI)	ELONG (%)	RA (%)	E (MSI)
MCDONNELL DOUGLAS, CA	300	L TRANS	55.4	50.1	4.0		9.6
			55.6	50.4	5.0		9.3
			56.2	51.0	5.0		9.8
NASA-LANGLEY	300	L TRANS	60.6	53.0	7.0		11.3
			59.8	51.0			11.2
			59.9	52.0	9.0		11.2
		AVERAGE	57.9	51.2	6.0		10.4
		STANDARD DEVIATION	2.4	1.1	2.0		0.9

TABLE A5
TENSILE RESULTS FOR
ALLIED SIGNAL FVS0812 (8009) SHEET (0.090" THICK)

COMPANY	TEST TEMP (DEGREES F.)	ORIENT- ATION	ULTIMATE STRENGTH (KSI)	YIELD STRENGTH (KSI)	ELONG (%)	RA (%)	E (MSI)	
GENERAL DYNAMICS, CA	450	LONG	42.2	38.1	12.0			
			40.4	36.6	10.0			
			42.2	39.1	12.0			
MCDONNELL DOUGLAS	450	LONG	41.3	39.8	8.0	9.7		
			41.8	39.9	8.0	9.8		
			42.0	40.7	8.0	10.1		
			42.0	39.9	9.0	9.8		
ROHR INDUSTRIES	450	LONG	48.7	44.7	9.5	9.5		
			47.6	43.5	8.5	9.2		
			46.8	43.0	8.3	9.0		
GENERAL DYNAMICS, TX	450	LONG	39.9	38.3	10.0	10.3		
			39.8	37.1	7.6	10.0		
			41.1		10.6	10.7		
MCDONNELL DOUGLAS, CA	450	LONG	44.4	42.3	8.0	8.8		
			45.1	42.9	6.0	9.4		
			45.0	42.8	8.0	9.6		
AIR FORCE	450	LONG	43.9	41.3	8.9			
			42.1	40.3	9.7			
			45.2	44.4	7.5			
NASA-LANGLEY	450	LONG	48.9	42.0	13.0	10.2		
			49.1	42.0	15.0	10.3		
			48.4	41.0	12.0	10.0		
		AVERAGE	44.0	40.9	9.5	9.8		
		STANDARD DEVIATION	3.1	2.3	2.2	0.5		

TABLE A6
 TENSILE RESULTS FOR
 ALLIED SIGNAL FVS0812 (8009) SHEET (0.090" THICK)

COMPANY	TEST TEMP (DEGREES F)	ORIENT- ATION	ULTIMATE STRENGTH (KSI)	YIELD STRENGTH (KSI)	ELONG (%)	RA (%)	E (MSI)
GENERAL DYNAMICS, CA	450	L TRANS	42.1	36.2	12.0		
			42.2	36.5	10.0		
			41.7	34.6	7.0		
MCDONNELL DOUGLAS	450	L TRANS	39.4	34.8	9.0	9.6	
			41.9	37.7	10.0	9.9	
			40.7	37.0	10.0	10.1	
ROHR INDUSTRIES	450	L TRANS	47.5	42.6	9.5	9.6	
			48.3	42.9	9.2	9.6	
			47.5	43.7	8.5	9.2	
GENERAL DYNAMICS, TX	450	L TRANS	42.9		6.7		
			39.9	35.9	7.9	10.9	
MCDONNELL DOUGLAS, CA	450	L TRANS	43.8	41.3	7.0	9.2	
			44.9	41.4	8.0	9.0	
			43.9	40.5	7.0	10.0	
AIR FORCE	450	L TRANS	39.5	36.7	9.3		
			42.7	36.4	9.1		
			44.8	38.9	8.9		
NASA-LANGLEY	450	L TRANS	50.1	41.5		10.6	
			49.4	40.0	12.0	10.5	
			49.9	40.0		10.5	
		AVERAGE	44.2	38.9	9.0	9.9	
		STANDARD DEVIATION	3.5	2.9	1.6	0.6	

TABLE A7
TENSILE RESULTS FOR
ALLIED SIGNAL FVS0812 (8009) SHEET (0.090" THICK)

COMPANY	TEST TEMP (DEGREES F)	ORIENT-ATION	ULTIMATE STRENGTH (KSI)	YIELD STRENGTH (KSI)	ELONG (%)	RA (%)	E (MSI)
GENERAL DYNAMICS, CA	600	LONG	28.6	26.0	6.0		
			28.8	26.0	10.0		
			27.7	24.9	12.0		
MCDONNELL DOUGLAS	600	LONG	30.2	28.9	10.0	8.8	
			32.3	29.4	10.0	8.8	
			33.2	32.6	9.0	9.5	
ROHR INDUSTRIES	600	LONG	33.0	28.9	14.2	7.8	
			32.2	28.3	9.3	7.5	
			32.2	27.8	14.7	7.5	
GENERAL DYNAMICS, TX	600	LONG	30.2	25.8	12.1	9.9	
			29.0	24.6	7.1	9.7	
			24.5		11.8	8.4	
AIR FORCE	600	LONG	31.3	29.3	11.8		
			30.1	27.3	12.0		
			31.7	29.6	11.7		
		AVERAGE	30.3	27.8	10.8		8.7
		STANDARD DEVIATION	2.3	2.2	2.4		0.9

TABLE A8
TENSILE RESULTS FOR
ALLIED SIGNAL FVS0812 (8009) SHEET (0.090" THICK)

COMPANY	TEST TEMP (DEGREES F)	ORIENT- ATION	ULTIMATE STRENGTH (KSI)	YIELD STRENGTH (KSI)	ELONG (%)	RA (%)	E (MSI)
GENERAL DYNAMICS, CA	600	L TRANS	29.3	24.7	10.0		
			28.2	23.3	11.0		
			28.0	22.5	10.0		
MCDONNELL DOUGLAS	600	L TRANS	28.2	25.4	14.0	9.1	
			28.2	25.2	14.0	9.1	
			28.6	25.4	14.0	9.2	
ROHR INDUSTRIES	600	L TRANS	32.9	27.5	14.5	8.1	
			33.6	30.9	10.3	8.3	
			33.3	27.9	12.9	7.4	
GENERAL DYNAMICS, TX	600	L TRANS	29.4	24.6	15.8	9.3	
			31.2	25.8	14.6	9.6	
AIR FORCE	600	L TRANS	31.8	28.9	12.5		
			32.5	27.7	10.5		
			32.0	28.2	11.1		
		AVERAGE	30.5	26.3	12.5		8.8
		STANDARD DEVIATION	2.1	2.3	2.0		0.7

TABLE A9

**TENSILE RESULTS FOR
ALLIED SIGNAL FVS0812 (8009) SHEET (0.090" THICK)**

COMPANY	TEST TEMP (DEGREES F)	ORIENT- ATION	ULTIMATE STRENGTH (KSI)	YIELD STRENGTH (KSI)	ELONG (%)	RA (%)	E (MSI)
GENERAL DYNAMICS	-320	LONG	101.4	93.4			
			107.8	86.0	1.0		
			108.0	93.0	1.5		
AVERAGE			105.7	90.8	1.3		
STANDARD DEVIATION			3.8	4.2	0.4		

TABLE A10

**TENSILE RESULTS FOR
ALLIED SIGNAL FVS0812 (8009) SHEET (0.090" THICK)
(1000 HR EXPOSURE @ 450F)**

COMPANY	TEST TEMP (DEGREES F)	ORIENT- ATION	ULTIMATE STRENGTH (KSI)	YIELD STRENGTH (KSI)	ELONG (%)	RA (%)	E (MSI)
MCDONNELL DOUGLAS, CA	RT	LONG	67.8	63.4	10.0		11.4
			67.8	63.0	10.0		11.6
			67.8	63.4	10.0		11.4
			68.0	62.8	10.0		11.9
			67.3	62.2	7.0		11.6
			67.9	62.6	8.0		11.7
AVERAGE			67.8	62.9	9.2		11.6
STANDARD DEVIATION			0.2	0.5	1.3		0.2

TABLE A11

TENSILE RESULTS FOR
 ALLIED SIGNAL FVS0812 (8009) SHEET (0.090" THICK)
 (AFTER 100 HRS @450F)

COMPANY	TEST TEMP (DEGREES F)	ORIENT-ATION	ULTIMATE STRENGTH (KSI)	YIELD STRENGTH (KSI)	ELONG (%)	RA (%)	E (MSI)
NORTHROP	450	LONG	43.3	41.6	8.5		11.4
			43.4	42.3	9.0		10.1
		AVERAGE	43.4	42.0	8.8		10.8
		STANDARD DEVIATION	0.1	0.5	0.4		0.9

TABLE A12

TENSILE RESULTS FOR
 ALLIED SIGNAL FVS0812 (8009) SHEET (0.090" THICK)
 (AFTER 100 HRS @450F)

COMPANY	TEST TEMP (DEGREES F)	ORIENT-ATION	ULTIMATE STRENGTH (KSI)	YIELD STRENGTH (KSI)	ELONG (%)	RA (%)	E (MSI)
NORTHROP	450	L TRANS	45.6	39.5	8.5		11.0
			44.1	39.9	9.0		10.8
			43.3	39.5	9.0		10.1
		AVERAGE	44.3	39.6	8.8		10.6
		STANDARD DEVIATION	1.2	0.2	0.3		0.5

TABLE A13

TENSILE RESULTS FOR
 ALLIED SIGNAL FVS0812 (8009) SHEET (0.090" THICK)
 (AFTER 100 HRS @600F)

COMPANY	TEST TEMP (DEGREES F)	ORIENT-ATION	ULTIMATE STRENGTH (KSI)	YIELD STRENGTH (KSI)	ELONG (%)	RA (%)	E (MSI)
NORTHROP	600	LONG	31.2	28.8	13.0		9.5
			30.2	29.4	13.0		9.6
			30.7	29.6	13.0		9.6
		AVERAGE	30.7	29.3	13.0		9.6
		STANDARD DEVIATION	0.5	0.4	0.0		0.1

TABLE A14

TENSILE RESULTS FOR
 ALLIED SIGNAL FVS0812 (8009) SHEET (0.090" THICK)
 (AFTER 100 HRS @600F)

COMPANY	TEST TEMP (DEGREES F)	ORIENT-ATION	ULTIMATE STRENGTH (KSI)	YIELD STRENGTH (KSI)	ELONG (%)	RA (%)	E (MSI)
NORTHROP	600	L TRANS	30.1	28.7	13.5		10.0
			30.6	29.2	13.5		9.5
			29.9	29.4	14.0		10.0
		AVERAGE	30.2	29.1	13.7		9.8
		STANDARD DEVIATION	0.4	0.4	0.3		0.3

TABLE A15
COMPRESSION RESULTS FOR
ALLIED SIGNAL FVS0812 (8009) SHEET (0.090" THICK)

COMPANY	TEST TEMPERATURE (DEGREES F)	ORIENTATION	COMPRESSIVE YIELD STRENGTH (KSI)	COMPRESSIVE MODULUS (KSI)
GENERAL DYNAMICS, CA	RT	LONG	48.5 49.5 49.1	
MCDONNELL DOUGLAS	RT	LONG	56.1 52.6 51.9 51.1 50.2	9.0 11.7 12.2
ROHR INDUSTRIES	RT	LONG	51.6 53.8 54.2	12.3 12.1 12.1
GENERAL DYNAMICS, TX	RT	LONG	47.8	12.0
MCDONNELL DOUGLAS, CA	RT	LONG	55.3 56.3 56.1	11.4 11.8 11.2
AIR FORCE	RT	LONG	39.6 45.8 45.5	
NORTHROP	RT	LONG	48.2 50.4	13.3 12.4
		AVERAGE	50.7	11.8
		STANDARD DEVIATION	4.2	1.0

TABLE A16
 COMPRESSION RESULTS FOR
 ALLIED SIGNAL FVS0812 (8009) SHEET (0.090" THICK)

COMPANY	TEST TEMPERATURE (DEGREES F)	ORIENTATION	COMPRESSIVE YIELD STRENGTH (KSI)	COMPRESSIVE MODULUS (KSI)
GENERAL DYNAMICS, CA	RT	L TRANS	57.7	
			57.6	
			57.3	
MCDONNELL DOUGLAS	RT	L TRANS	59.5 61.8	12.0 11.7
ROHR INDUSTRIES	RT	L TRANS	62.8 64.2 62.9	12.7 12.4 12.3
GENERAL DYNAMICS, TX	RT	L TRANS	50.5	11.6
MCDONNELL DOUGLAS, CA	RT	L TRANS	65.7 65.5 66.3	11.8 12.1 11.6
AIR FORCE	RT	L TRANS	57.6 59.7	
NORTHROP	RT	L TRANS	60.4 61.1	13.1 13.1
		AVERAGE	60.7	12.2
		STANDARD DEVIATION	4.1	0.6

TABLE A17
COMPRESSION RESULTS FOR
ALLIED SIGNAL FVS0812 (8009) SHEET (0.090" THICK)

COMPANY	TEST TEMPERATURE (DEGREES F)	ORIENTATION	COMPRESSIVE YIELD STRENGTH (KSI)	COMPRESSIVE MODULUS (KSI)
MCDONNELL DOUGLAS, CA	300	LONG	43.6 51.9 45.0	10.1 10.7 10.7
		AVERAGE	46.8	10.5
		STANDARD DEVIATION	4.4	0.3

TABLE A18
COMPRESSION RESULTS FOR
ALLIED SIGNAL FVS0812 (8009) SHEET (0.090" THICK)

COMPANY	TEST TEMPERATURE (DEGREES F)	ORIENTATION	COMPRESSIVE YIELD STRENGTH (KSI)	COMPRESSIVE MODULUS (KSI)
MCDONNELL DOUGLAS, CA	300	L TRANS	49.7 55.7 56.7	9.8 11.0 10.5
		AVERAGE	54.0	10.4
		STANDARD DEVIATION	3.8	0.6

TABLE A19

COMPRESSION RESULTS FOR
ALLIED SIGNAL FVS0812 (8009) SHEET (0.090" THICK)

COMPANY	TEST TEMPERATURE (DEGREES F)	ORIENTATION	COMPRESSIVE YIELD STRENGTH (KSI)	COMPRESSIVE MODULUS (KSI)
GENERAL DYNAMICS, CA	450	LONG	32.4 35.4 31.0	
MCDONNELL DOUGLAS	450	LONG	32.5 29.7 30.4	11.7 10.6 9.5
ROHR INDUSTRIES	450	LONG	44.2 43.5 45.9	10.0 10.4 10.0
GENERAL DYNAMICS, TX	450	LONG	29.8	8.7
MCDONNELL DOUGLAS, CA	450	LONG	38.0 36.8 37.4	9.1 9.8 9.0
AIR FORCE	450	LONG	35.6 35.4 35.4	
		AVERAGE	35.8	9.9
		STANDARD DEVIATION	5.1	0.9

TABLE A20
COMPRESSION RESULTS FOR
ALLIED SIGNAL FVS0812 (8009) SHEET (0.090" THICK)

COMPANY	TEST TEMPERATURE (DEGREES F)	ORIENTATION	COMPRESSIVE YIELD STRENGTH (KSI)	COMPRESSIVE MODULUS (KSI)
GENERAL DYNAMICS, CA	450	L TRANS	36.9	
			40.5	
			38.6	
MCDONNELL DOUGLAS	450	L TRANS	42.6	11.2
			40.5	9.8
			43.4	11.5
ROHR INDUSTRIES	450	L TRANS		9.9
				9.5
			45.2	10.3
GENERAL DYNAMICS, TX	450	L TRANS	35.3	9.4
			35.6	9.3
MCDONNELL DOUGLAS, CA	450	L TRANS	41.6	10.4
			41.1	10.5
			40.7	10.5
AIR FORCE	450	L TRANS	35.5	
			43.8	
			44.5	
		AVERAGE	40.4	10.2
		STANDARD DEVIATION	3.3	0.7

TABLE A21
 COMPRESSION RESULTS FOR
 ALLIED SIGNAL FVS0812 (8009) SHEET (0.090" THICK)

COMPANY	TEST TEMPERATURE (DEGREES F)	ORIENTATION	COMPRESSIVE YIELD STRENGTH (KSI)	COMPRESSIVE MODULUS (KSI)
GENERAL DYNAMICS, CA	600	LONG	23.6 27.3 25.9	
MCDONNELL DOUGLAS	600	LONG	23.3 26.5 30.1	9.1 11.0 11.6
ROHR INDUSTRIES	600	LONG	27.5 23.9 22.6	7.8 8.1 8.2
GENERAL DYNAMICS, TX	600	LONG		7.7 8.8 8.5
AIR FORCE	600	LONG	28.5 28.1	
		AVERAGE	25.5	9.0
		STANDARD DEVIATION	2.8	1.4

TABLE A22
COMPRESSION RESULTS FOR
ALLIED SIGNAL FVS0812 (8009) SHEET (0.090" THICK)

COMPANY	TEST TEMPERATURE (DEGREES F)	ORIENTATION	COMPRESSIVE YIELD STRENGTH (KSI)	COMPRESSIVE MODULUS (KSI)
GENERAL DYNAMICS, CA	600	L TRANS	28.3 22.4 23.5	
MCDONNELL DOUGLAS	600	L TRANS	31.3 31.5 32.6	10.1 10.8 10.6
ROHR INDUSTRIES	600	L TRANS	24.5 25.2 24.0	8.3 8.5 8.4
GENERAL DYNAMICS, TX	600	L TRANS	24.3 25.2	8.6
AIR FORCE	600	L TRANS	30.9 31.7	
		AVERAGE	27.3	9.3
		STANDARD DEVIATION	3.8	1.1

TABLE A23

SLOTTED SHEAR RESULTS FOR
ALLIED SIGNAL FVS0812 (8009) SHEET (0.090" THICK)

COMPANY	TEST TEMPERATURE (DEGREES F)	ORIENTATION	SHEAR STRENGTH (KSI)
GENERAL DYNAMICS, CA	RT	L-S	39.7
			39.5
			39.4
		AVERAGE	39.5
		STANDARD DEVIATION	0.2

TABLE A24

SLOTTED SHEAR RESULTS FOR
ALLIED SIGNAL FVS0812 (8009) SHEET (0.090" THICK)

COMPANY	TEST TEMPERATURE (DEGREES F)	ORIENTATION	SHEAR STRENGTH (KSI)
GENERAL DYNAMICS, CA	RT	T-S	39.5
			39.6
			40.0
GENERAL DYNAMICS, TX	RT	T-S	40.3
			40.8
		AVERAGE	40.0
		STANDARD DEVIATION	0.5

TABLE A25
SLOTTED SHEAR RESULTS FOR
ALLIED SIGNAL FVS0812 (8009) SHEET (0.090" THICK)

COMPANY	TEST TEMPERATURE (DEGREES F)	ORIENTATION	SHEAR STRENGTH (KSI)
GENERAL DYNAMICS, CA	450	L-S	27.1
			27.2
			27.0
		AVERAGE	27.1
		STANDARD DEVIATION	0.1

TABLE A26
SLOTTED SHEAR RESULTS FOR
ALLIED SIGNAL FVS0812 (8009) SHEET (0.090" THICK)

COMPANY	TEST TEMPERATURE (DEGREES F)	ORIENTATION	SHEAR STRENGTH (KSI)
GENERAL DYNAMICS, CA	450	T-S	26.8
			26.0
			27.3
GENERAL DYNAMICS, TX	450	T-S	27.4
		AVERAGE	27.4
		STANDARD DEVIATION	0.5

TABLE A27

SLOTTED SHEAR RESULTS FOR
ALLIED SIGNAL FVS0812 (8009) SHEET (0.090" THICK)

COMPANY	TEST TEMPERATURE (DEGREES F)	ORIENTATION	SHEAR STRENGTH (KSI)
GENERAL DYNAMICS, CA	600	L-S	21.8
			22.6
			21.8
		AVERAGE	22.1
		STANDARD DEVIATION	0.5

TABLE A28

SLOTTED SHEAR RESULTS FOR
ALLIED SIGNAL FVS0812 (8009) SHEET (0.090" THICK)

COMPANY	TEST TEMPERATURE (DEGREES F)	ORIENTATION	SHEAR STRENGTH (KSI)
GENERAL DYNAMICS, CA	600	T-S	21.8
			21.6
			21.3
GENERAL DYNAMICS, TX	600	T-S	21.1
			20.7
		AVERAGE	21.6
		STANDARD DEVIATION	0.3

TABLE A29
BEARING RESULTS FOR
ALLIED SIGNAL FVS0812 (8009) SHEET (0.090" THICK)

COMPANY	TEST TEMPERATURE (DEGREES F)	ORIENTATION	e/D	BEARING ULT. STR. (KSI)	BEARING YIELD STR. (KSI)
GENERAL DYNAMICS, CA	RT	LONG	1.5	90.2 90.4 88.4	76.7 73.1 72.5
MCDONNELL DOUGLAS	RT	LONG	1.5	90.4 97.6 96.3	85.6 87.7 87.5
ROHR INDUSTRIES	RT	LONG	1.5	104.5 106.1 105.5	99.6 99.6 101.3
MCDONNELL DOUGLAS, CA	RT	LONG	1.5	94.1 92.9 90.1	90.9 89.2 87.8
AIR FORCE	RT	LONG	1.5	81.8 81.6 81.8	77.3 77.7 79.8
NASA-LANGLEY	RT	LONG	1.5	100.4 96.6 100.4 101.3	93.6 93.9 92.4 95.2 94.3
			AVERAGE	94.2	87.8
			STANDARD DEVIATION	7.8	8.9

TABLE A30
BEARING RESULTS FOR
ALLIED SIGNAL FVS0812 (8009) SHEET (0.090" THICK)

COMPANY	TEST TEMPERATURE (DEGREES F)	ORIENTATION	e/D	BEARING ULT. STR. (KSI)	BEARING YIELD STR. (KSI)
GENERAL DYNAMICS, CA	RT	L TRANS	1.5	117.3 115.4 116.2	102.4 100.2 102.9
MCDONNELL DOUGLAS	RT	L TRANS	1.5	96.3 93.3 92.0	88.6 87.3 86.1
ROHR INDUSTRIES	RT	L TRANS	1.5	107.3 103.0 104.0	101.9 97.0 98.5
MCDONNELL DOUGLAS, CA	RT	L TRANS	1.5	93.9 91.6 93.6	92.2 91.3 90.7
AIR FORCE	RT	L TRANS	1.5	82.2 82.0	76.4 77.8
NASA-LANGLEY	RT	L TRANS	1.5	97.4 103.3 94.2 97.8 96.7	95.0 94.1 93.5 90.2
			AVERAGE	98.8	92.6
			STANDARD DEVIATION	10.1	7.6

TABLE A31

BEARING RESULTS FOR
 ALLIED SIGNAL FVS0812 (8009) SHEET (0.090" THICK)

COMPANY	TEST TEMPERATURE (DEGREES F)	ORIENTATION	e/D	BEARING ULT. STR. (KSI)	BEARING YIELD STR. (KSI)
MCDONNELL DOUGLAS, CA	300	LONG	1.5	80.4 81.7 85.9	72.1 70.4 73.7
			AVERAGE	82.7	72.1
			STANDARD DEVIATION	2.9	1.6

TABLE A32

BEARING RESULTS FOR
 ALLIED SIGNAL FVS0812 (8009) SHEET (0.090" THICK)

COMPANY	TEST TEMPERATURE (DEGREES F)	ORIENTATION	e/D	BEARING ULT. STR. (KSI)	BEARING YIELD STR. (KSI)
MCDONNELL DOUGLAS, CA	300	L TRANS	1.5	85.7 85.5 85.4	76.4 75.0 75.5
			AVERAGE	85.5	75.6
			STANDARD DEVIATION	0.1	0.7

TABLE A33
BEARING RESULTS FOR
ALLIED SIGNAL FVS0812 (8009) SHEET (0.090" THICK)

COMPANY	TEST TEMPERATURE (DEGREES F)	ORIENTATION	O/D	BEARING ULT. STR. (KSI)	BEARING YIELD STR. (KSI)
GENERAL DYNAMICS, CA	450	LONG	1.5	61.7 62.8 63.8	49.4 52.0 50.3
MCDONNELL DOUGLAS	450	LONG	1.5	69.4 68.1 67.0	65.1 63.8 63.3
ROHR INDUSTRIES	450	LONG	1.5	75.9 74.1 78.1	65.4 68.0 66.7
MCDONNELL DOUGLAS, CA	450	LONG	1.5	66.0 69.2 70.6	60.5 63.4 61.4
AIR FORCE	450	LONG	1.5	71.3 70.3	58.0 62.5
			AVERAGE	69.2	60.7
			STANDARD DEVIATION	4.8	6.0

TABLE A34

**BEARING RESULTS FOR
ALLIED SIGNAL FVS0812 (8009) SHEET (0.090" THICK)**

COMPANY	TEST TEMPERATURE (DEGREES F)	ORIENTATION	•/D	BEARING				
				ULT.	STR. (KSI)			
GENERAL DYNAMICS, CA	450	L TRANS	1.5	62.4	56.2			
				60.8	49.8			
				61.7	52.0			
MCDONNELL DOUGLAS	450	L TRANS	1.5	68.2	64.2			
				68.5	64.9			
				70.7	66.4			
ROHR INDUSTRIES	450	L TRANS	1.5	76.5	68.9			
				74.2	65.0			
				76.3	68.6			
MCDONNELL DOUGLAS, CA	450	L TRANS	1.5	71.2	66.4			
				70.4	62.8			
				70.9	64.1			
AIR FORCE	450	L TRANS	1.5	71.3	64.1			
				69.7	60.6			
				69.7	63.4			
AVERAGE				69.5	62.5			
STANDARD DEVIATION				4.8	5.6			

TABLE A35
BEARING RESULTS FOR
ALLIED SIGNAL FVS0812 (8009) SHEET (0.090" THICK)

COMPANY	TEST TEMPERATURE (DEGREES F)	ORIENTATION	E/D	BEARING ULT. STR. (KSI)	BEARING YIELD STR. (KSI)
GENERAL DYNAMICS, CA	600	LONG	1.5	50.1 49.8 50.0	40.2 39.3 39.2
MCDONNELL DOUGLAS	600	LONG	1.5	49.4 47.9 47.5	46.3 44.4 45.0
ROHR INDUSTRIES	600	LONG	1.5	58.3 57.7 53.6	47.5 47.7 48.0
AIR FORCE	600	LONG	1.5	55.1 53.9 56.1	45.5 47.2 47.2
			AVERAGE	52.5	44.8
			STANDARD DEVIATION	3.8	3.3

TABLE A36
BEARING RESULTS FOR
ALLIED SIGNAL FVS0812 (8009) SHEET (0.090" THICK)

COMPANY	TEST TEMPERATURE (DEGREES F)	ORIENTATION	E/D	BEARING ULT. STR. (KSI)	BEARING YIELD STR. (KSI)			
GENERAL DYNAMICS, CA	600	L TRANS	1.5	49.9	43.2			
				49.9	42.2			
				50.3	41.8			
MCDONNELL DOUGLAS	600	L TRANS	1.5	51.2	49.0			
				51.2	48.4			
				51.6	49.0			
ROHR INDUSTRIES	600	L TRANS	1.5	58.3	49.6			
				58.1	48.5			
				57.3	48.1			
AIR FORCE	600	L TRANS	1.5	54.7	47.4			
				52.0	43.1			
				56.4	47.1			
AVERAGE				53.4	46.5			
STANDARD DEVIATION				3.3	3.0			

TABLE A37
BEARING RESULTS FOR
ALLIED SIGNAL FVS0812 (8009) SHEET (0.090" THICK)

COMPANY	TEST TEMPERATURE (DEGREES F)	ORIENTATION	e/D	BEARING ULT. STR. (KSI)	BEARING YIELD STR. (KSI)
GENERAL DYNAMICS, CA	RT	LONG	2.0	113.3 115.3 113.6	84.8 79.4 79.5
MCDONNELL DOUGLAS	RT	LONG	2.0	111.0 122.0 123.0	91.7 95.0 95.3
ROHR INDUSTRIES	RT	LONG	2.0	128.5 128.0 123.5	110.5 106.3 109.2
GENERAL DYNAMICS, TX	RT	LONG	2.0	119.6	93.1
MCDONNELL DOUGLAS, CA	RT	LONG	2.0	116.3 114.0 115.0	96.2 96.6 95.5
AIR FORCE	RT	LONG	2.0	109.9 103.6 101.5	91.7 94.2 86.6
NASA-LANGLEY	RT	LONG	2.0	128.9 129.5 128.9 130.5 127.2 126.3 128.5	106.0 108.0 103.6 103.6 100.8 98.3 101.2
NORTHROP	RT	LONG	2.0	128.9 131.4	105.1 107.9
		AVERAGE		120.9	97.6
		STANDARD DEVIATION		8.9	8.9

TABLE A38
BEARING RESULTS FOR
ALLIED SIGNAL FVS0812 (8009) SHEET (0.090" THICK)

COMPANY	TEST TEMPERATURE (DEGREES F)	ORIENTATION	e/D	BEARING ULT. STR. (KSI)	BEARING YIELD STR. (KSI)
GENERAL DYNAMICS, CA	RT	L TRANS	2.0	114.7 113.4 113.1	82.5 84.8 80.6
MCDONNELL DOUGLAS	RT	L TRANS	2.0	123.0 123.0 117.0	97.9 99.1 96.5
ROHR INDUSTRIES	RT	L TRANS	2.0	130.0 129.4 130.5	114.3 112.6 113.6
GENERAL DYNAMICS, TX	RT	L TRANS	2.0	93.6	93.6
MCDONNELL DOUGLAS, CA	RT	L TRANS	2.0	110.3 118.0 114.7	98.7 98.1 98.5
AIR FORCE	RT	L TRANS	2.0	95.4 96.4 96.5	81.7 81.4 87.3
NASA-LANGLEY	RT	L TRANS	2.0	131.6 129.0 130.3 126.1 129.4 132.5 131.7	105.9 105.1 102.8 101.1 102.8 103.8 110.9
NORTHROP	RT	L TRANS	2.0	128.5 130.0	107.6 107.6
			AVERAGE	119.5	98.7
			STANDARD DEVIATION	12.7	10.5

TABLE A39
BEARING RESULTS FOR
ALLIED SIGNAL FVS0812 (8009) SHEET (0.090" THICK)

COMPANY	TEST TEMPERATURE (DEGREES F)	ORIENTATION	e/D	BEARING ULT. STR. (KSI)	BEARING YIELD STR. (KSI)
MCDONNELL DOUGLAS, CA	300	LONG	2.0	105.5 106.9 105.7	78.3 79.3 77.4
			AVERAGE	106.0	78.3
			STANDARD DEVIATION	0.8	0.9

TABLE A40
BEARING RESULTS FOR
ALLIED SIGNAL FVS0812 (8009) SHEET (0.090" THICK)

COMPANY	TEST TEMPERATURE (DEGREES F)	ORIENTATION	e/D	BEARING ULT. STR. (KSI)	BEARING YIELD STR. (KSI)
MCDONNELL DOUGLAS, CA	300	L TRANS	2.0	108.1 107.6 107.4	82.9 82.7 81.6
			AVERAGE	107.7	82.4
			STANDARD DEVIATION	0.3	0.7

TABLE A41
BEARING RESULTS FOR
ALLIED SIGNAL FVS0812 (8009) SHEET (0.090" THICK)

COMPANY	TEST TEMPERATURE (DEGREES F)	ORIENTATION	a/D	BEARING ULT. STR. (KSI)	BEARING YIELD STR. (KSI)
GENERAL DYNAMICS, CA	450	LONG	2.0	84.1	58.4
				84.2	56.1
				83.6	55.2
MCDONNELL DOUGLAS	450	LONG	2.0	86.5	70.6
				85.3	69.6
				84.0	69.1
ROHR INDUSTRIES	450	LONG	2.0	98.3	72.8
				110.8	75.2
				101.7	76.9
GENERAL DYNAMICS, TX	450	LONG	2.0	90.5	65.9
MCDONNELL DOUGLAS, CA	450	LONG	2.0	94.8	59.7
				86.0	68.1
				89.1	68.2
AIR FORCE	450	LONG	2.0	73.0	69.2
				72.0	65.1
				71.9	67.2
			AVERAGE	87.2	66.7
			STANDARD DEVIATION	10.6	6.4

TABLE A42
BEARING RESULTS FOR
ALLIED SIGNAL FVS0812 (8009) SHEET (0.090" THICK)

COMPANY	TEST TEMPERATURE (DEGREES F)	ORIENTATION	e/D	BEARING ULT. STR. (KSI)	BEARING YIELD STR. (KSI)			
GENERAL DYNAMICS, CA	450	L TRANS	2.0	84.5	59.8			
				78.6	53.9			
				80.2	53.8			
MCDONNELL DOUGLAS	450	L TRANS	2.0	86.5	74.2			
				83.7	72.6			
				84.9	72.7			
ROHR INDUSTRIES	450	L TRANS	2.0	93.3	77.3			
				97.8	74.9			
				92.7	69.9			
GENERAL DYNAMICS, TX	450	L TRANS	2.0	88.8	80.7			
				84.6	67.0			
MCDONNELL DOUGLAS, CA	450	L TRANS	2.0	89.1	73.7			
				89.2	72.0			
				90.9	72.1			
AIR FORCE	450	L TRANS	2.0	66.5	62.3			
				68.8	61.8			
				68.0	62.9			
AVERAGE				84.0	68.3			
STANDARD DEVIATION				9.1	7.9			

TABLE A43
BEARING RESULTS FOR
ALLIED SIGNAL FVS0812 (8009) SHEET (0.090" THICK)

COMPANY	TEST TEMPERATURE (DEGREES F)	ORIENTATION	E/D	BEARING ULT. STR. (KSI)	BEARING YIELD STR. (KSI)
GENERAL DYNAMICS, CA	600	LONG	2.0	64.0 63.0	45.8 45.9
MCDONNELL DOUGLAS	600	LONG	2.0	59.1 57.6 60.3	49.9 50.3 50.0
ROHR INDUSTRIES	600	LONG	2.0	72.0 74.1 76.1	54.6 51.9 56.3
GENERAL DYNAMICS, TX	600	LONG	2.0	58.1 61.3 62.2	47.3 48.9 52.4
AIR FORCE	600	LONG	2.0	51.3 52.1 51.6	47.5 50.2 48.0
			AVERAGE	61.6	49.9
			STANDARD DEVIATION	7.9	3.1

TABLE A44

BEARING RESULTS FOR
ALLIED SIGNAL FVS0812 (8009) SHEET (0.090" THICK)

COMPANY	TEST TEMPERATURE (DEGREES F)	ORIENTATION	ϕ/D	BEARING ULT. STR. (KSI)	BEARING YIELD STR. (KSI)			
GENERAL DYNAMICS, CA	600	L TRANS	2.0	62.8	46.8			
				62.3	46.6			
				62.9	46.2			
MCDONNELL DOUGLAS	600	L TRANS	2.0	60.8	51.6			
				60.3	50.9			
				60.9	50.9			
ROHR INDUSTRIES	600	L TRANS	2.0	76.6	57.2			
				76.4	56.5			
				73.1	57.1			
GENERAL DYNAMICS, TX	600	L TRANS	2.0	60.7	59.5			
				61.1	53.0			
AIR FORCE	600	L TRANS	2.0	47.0	43.4			
				48.1	43.8			
				46.8	45.6			
AVERAGE				61.4	50.7			
STANDARD DEVIATION				9.6	5.4			

TABLE A45

FRACTURE TOUGHNESS RESULTS FOR
 ALLIED SIGNAL FVS0812 (8009) SHEET (0.090" THICK)

COMPANY	TEST TEMPERATURE (DEGREES F)	ORIENTATION	K _c (KSI in ^{0.5})	COMMENT
NORTHROP	RT	L-T	155.0	INVALID
		T-L	155.0	INVALID

NOTE: VALUES INVALID PER ASTM E561

TABLE A46
FATIGUE RESULTS WITH R=0.1 AND Kt=1.0 FOR
ALLIED SIGNAL FVS0812 (8009) SHEET (0.090" THICK)

COMPANY	TEST TEMPERATURE (DEGREES F)	ORIENTATION	STRESS (KSI)	CYCLES
GENERAL DYNAMICS, CA	RT	LONG	35.0	230,000
			34.0	54,900
			34.0	102,000
			33.0	28,541,600
			32.5	2,713,400
			32.2	206,900
			32.0	7,406,700
			30.9	21,336,800
			30.0	12,616,500 *
MCDONNELL DOUGLAS	RT	LONG	47.3	16,373
			47.3	18,430
			45.4	29,129
			45.4	25,080
			41.0	31,072
			41.0	71,659
			37.8	128,163
			37.8	110,037
ROHR INDUSTRIES	RT	LONG	50.0	15,000
			50.0	105,500
			50.0	1,280,000
			45.0	544,800
			45.0	998,000
			40.0	1,000,000
			40.0	503,500
			40.0	1,170,000
			35.0	1,000,000
			35.0	1,000,000 *
GENERAL DYNAMICS, TX	RT	LONG	50.0	23,020
			50.0	52,760
			47.0	136,150
			45.0	110,290
			42.0	1,000,000
			42.0	279,000
			40.0	1,200,000
			40.0	492,000
AIR FORCE	RT	LONG	49.5	32,700
			49.5	40,100
			49.0	179,000
			48.0	39,800
			47.0	36,900
			45.0	75,500
			45.0	63,500
			44.3	46,000
			44.0	461,500
			43.0	1,638,600
			42.0	6,740,000
			40.0	9,132,000
NORTHROP	RT	LONG	55.0	23,140
			52.0	91,416
			50.0	1,304,914
			48.0	562,313
			45.0	555,726
			43.0	190,784
			40.0	3,000,000
			30.0	3,000,000 *

(*): RUN OUT
#: BROKE IN GRIP AREA
(!): FAILED AT PIN HOLE & TEST CONTINUED

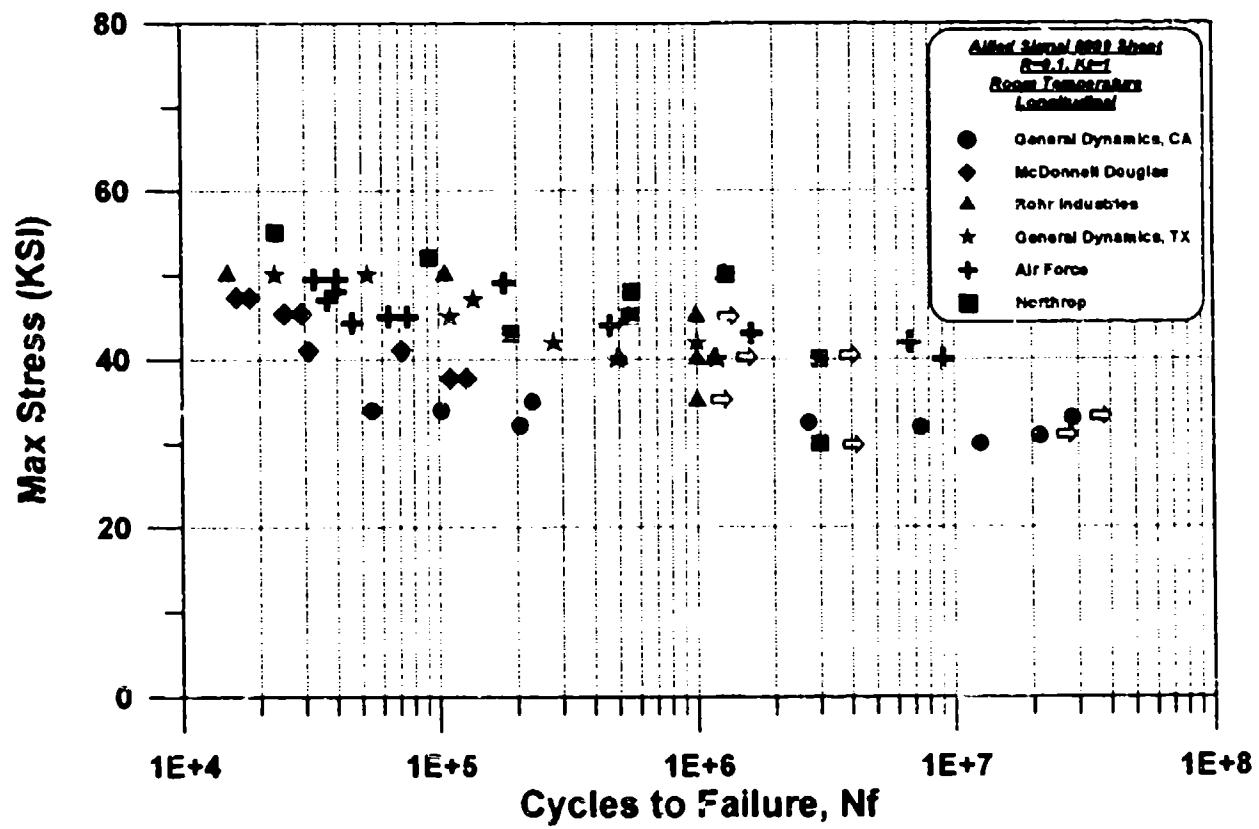


FIGURE A1. FATIGUE RESULTS FOR 8009 SHEET (LONGITUDINAL, ROOM TEMPERATURE).

TABLE A47

FATIGUE RESULTS WITH R=0.1 AND Kt=1.0 FOR
ALLIED SIGNAL FVS0812 (8009) SHEET (0.090" THICK)

COMPANY	TEST TEMPERATURE (DEGREES F)	ORIENTATION	STRESS (KSI)	CYCLES
GENERAL DYNAMICS, CA	450	LONG	30.0	102,300
			25.0	3,000,000
			20.0	3,322,100
MCDONNELL DOUGLAS	450	LONG	44.1	61,116
			44.1	42,240
			38.1	68,417
			38.1	87,324
			36.1	174,196
			36.1	195,374
			32.1	788,601
			32.1	659,468
ROHR INDUSTRIES	450	LONG	35.0	370,500
			35.0	624,500
			35.0	200,900
			30.0	318,300
			30.0	347,500
			30.0	132,700
			25.0	1,000,000
			25.0	1,000,000
			25.0	1,000,000
			20.0	1,000,000
GENERAL DYNAMICS, TX	450	LONG	42.5	33,702
			37.5	66,399
			37.5	66,456
			35.0	133,663
			32.5	423,815
			32.5	192,932
			27.5	771,911
			27.5	479,943
			22.5	1,251,023
			20.0	4,534,928
AIR FORCE	450	LONG	45.0	29,600
			40.0	49,800
			35.0	172,100
			30.0	2,589,700
			27.5	3,135,300
			25.0	4,219,900
			22.5	6,115,200

(*): RUN OUT
(#): BROKE IN GRIP AREA

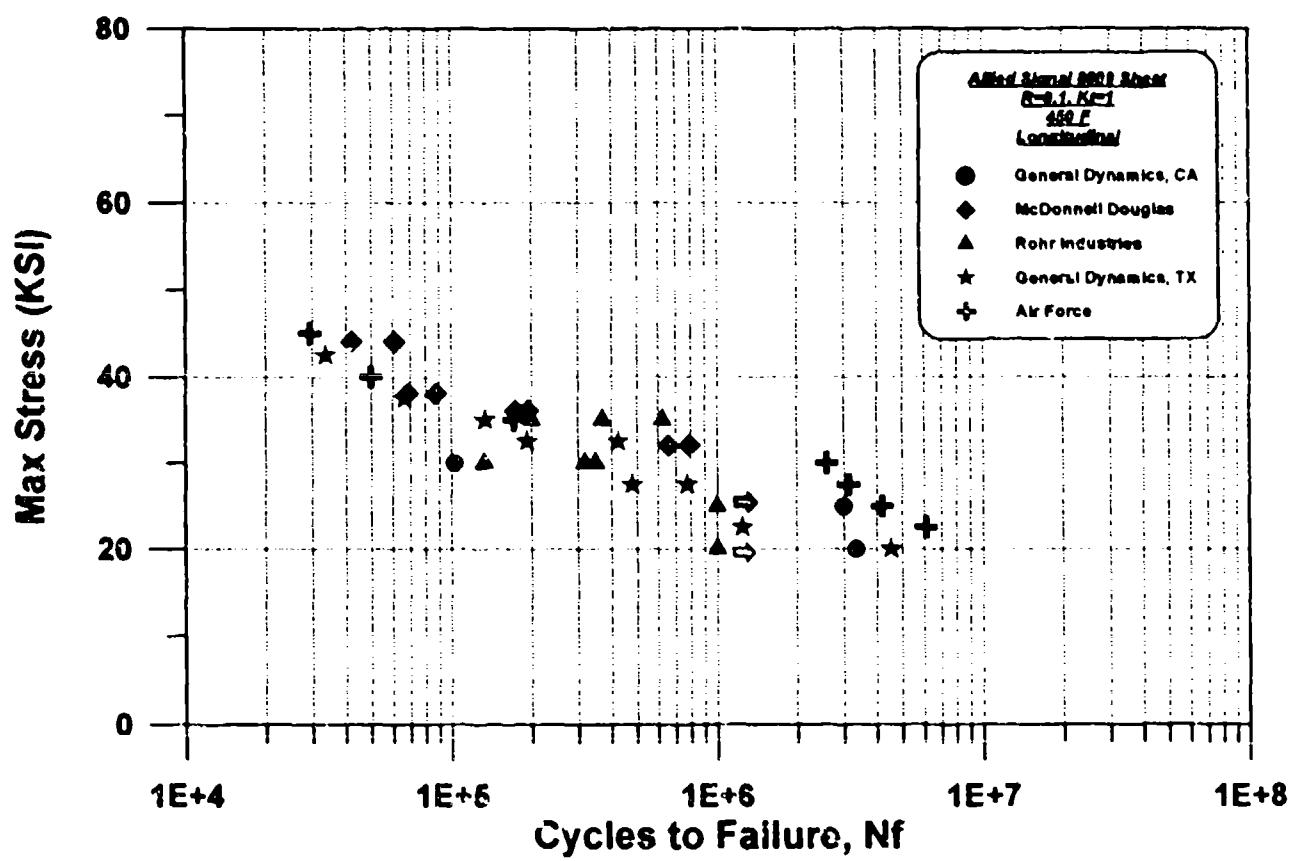


FIGURE A2. FATIGUE RESULTS FOR 8009 SHEET
(LONGITUDINAL, 450 F).

TABLE A48
FATIGUE RESULTS WITH R=0.1 AND KT=1.0 FOR
ALLIED SIGNAL FVS0812 (8009) SHEET (0.090" THICK)

COMPANY	TEST TEMPERATURE (DEGREES F)	ORIENTATION	STRESS (KSI)	CYCLES
GENERAL DYNAMICS, CA	600	LONG	25.0 23.0 22.5 22.3 22.1 22.0 22.0 20.0	186,300 351,300 165,500 103,200 332,900 10,527,400 * 414,800 504,700
MCDONNELL DOUGLAS	600	LONG	47.0 47.0 42.4 42.4 36.4 36.4 28.8 28.8	35,246 31,234 52,935 87,192 393,377 299,173 1,000,000 1,000,000 *
ROHR INDUSTRIES	600	LONG	35.0 35.0 35.0 30.0 30.0 30.0 25.0 25.0 25.0 20.0	45,200 55,400 50,200 173,800 213,400 289,100 1,000,000 * 1,000,000 * 1,000,000 * 1,000,000 *
GENERAL DYNAMICS, TX	600	LONG	40.0 40.0 35.0 35.0 30.0 30.0 25.0 25.0 25.0 20.0	693 2,006 37,096 24,532 132,940 43,350 242,851 985,031 1,671,616
AIR FORCE	600	LONG	35.0 30.0 25.0 25.0 22.0	17,700 66,230 357,900 609,700 9,900,000

(*): RUN OUT

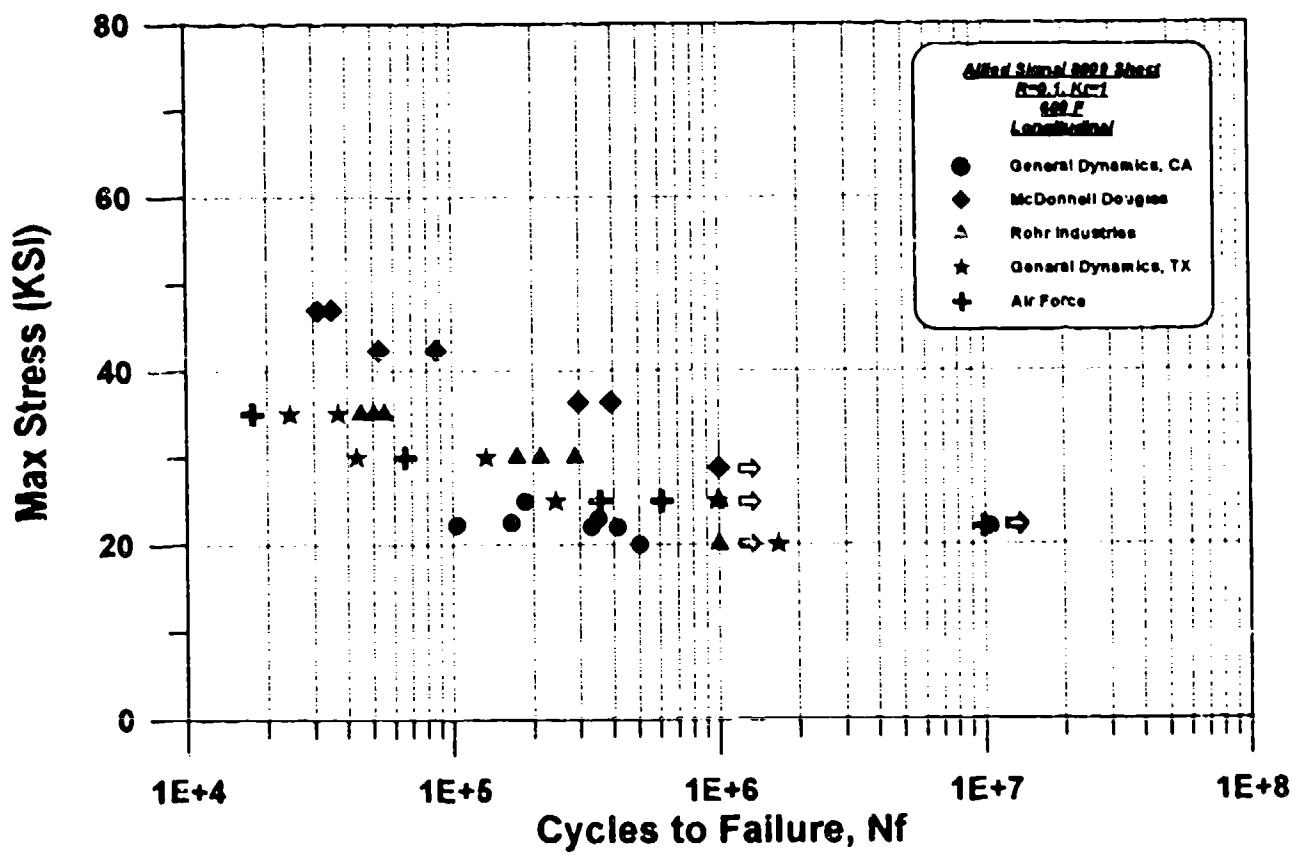


FIGURE A3. FATIGUE RESULTS FOR 8000 SHEET
 (LONGITUDINAL, 600 F).

TABLE A49

FATIGUE RESULTS WITH R=0.1 AND Kt=1.0 FOR
ALLIED SIGNAL FVSC812 (800S) SHEET (0.090" THICK)

COMPANY	TEST TEMPERATURE (DEGREES F)	ORIENTATION	STRESS (KSI)	CYCLES
MCDONNELL DOUGLAS	RT	L TRANS	52.9	38,255
			52.9	27,853
			47.0	48,533
			47.0	58,110
			41.2	97,090
			41.2	99,455
			35.3	1,000,000
			35.3	698,178

(*) : RUN OUT

(!) : FAILED AT PIN HOLE & TEST CONTINUED

TABLE A50

FATIGUE RESULTS WITH R=0.1 AND Kt=1.0 FOR
 ALLIED SIGNAL FVS0812 (8009) SHEET (0.090" THICK)

COMPANY	TEST TEMPERATURE (DEGREES F)	ORIENTATION	STRESS (KSI)	CYCLES
MCDONNELL DOUGLAS	450	L TRANS	40.2	135,584
			40.2	112,975
			34.7	197,670
			34.7	224,606
			31.0	699,997
			31.0	832,632
			29.2	1,000,000
			29.2	1,000,000

(*) : RUN OUT

(#) : BROKE IN GRIP AREA

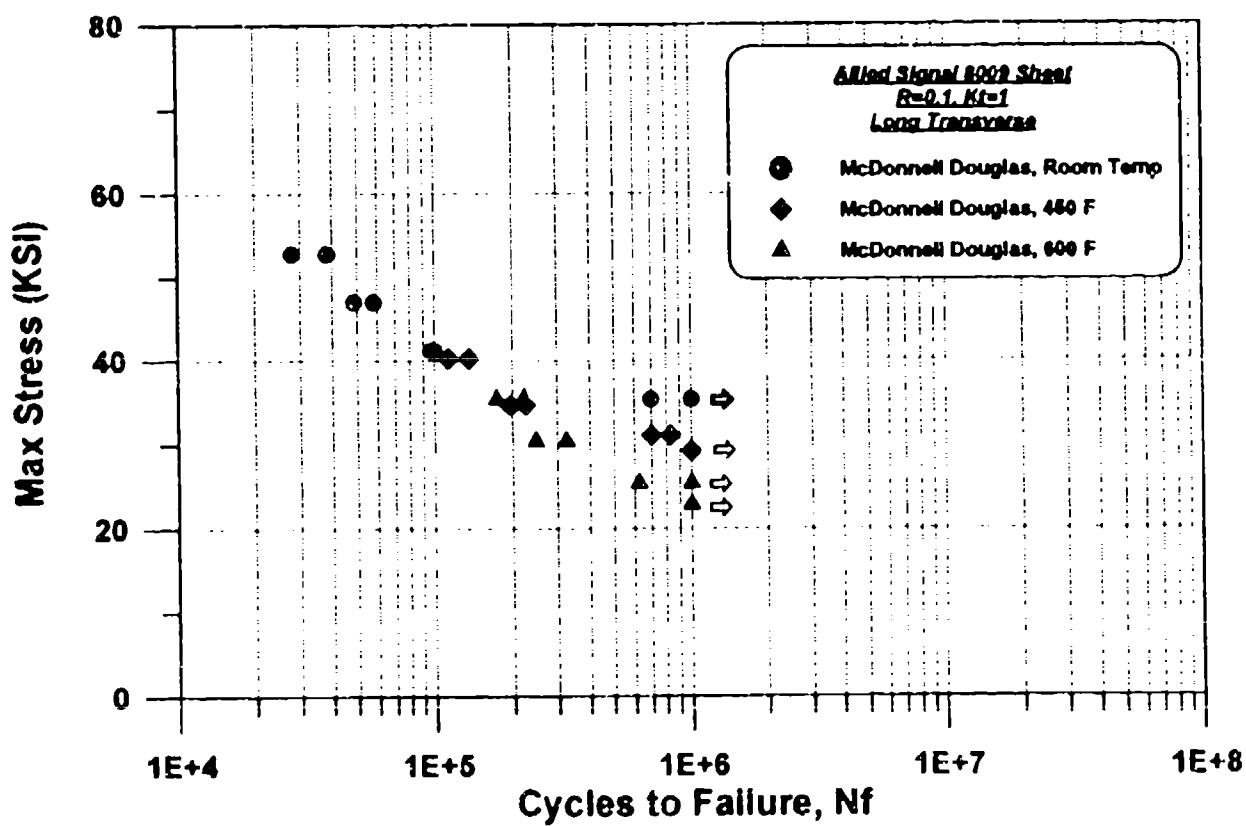
TABLE A51

FATIGUE RESULTS WITH R=0.1 AND Kt=1.0 FOR
 ALLIED SIGNAL FVS0812 (8009) SHEET (0.090" THICK)

COMPANY	TEST TEMPERATURE (DEGREES F)	ORIENTATION	STRESS (KSI)	CYCLES
MCDONNELL DOUGLAS	600	L TRANS	35.4	174,795
			35.4	220,271
			30.4	247,847
			30.4	325,351
			25.3	623,630
			25.3	1,000,000
			22.8	1,000,000
			22.8	1,000,000

(*): RUN OUT

(#): BROKE OUTSIDE OF REDUCED SECTION



**FIGURE A4. FATIGUE RESULTS FOR 8009 SHEET
(LONG TRANSVERSE, $K_t=1$)
MCDONNELL DOUGLAS.**

TABLE A52

FATIGUE RESULTS WITH R=0.1 AND Kt=3.0 FOR
ALLIED SIGNAL FVS0812 (8009) SHEET (0.090" THICK)

COMPANY	TEST TEMPERATURE (DEGREES F)	ORIENTATION	STRESS (KSI)	CYCLES
GENERAL DYNAMICS, CA	RT	LONG	25.4 18.2 17.0 15.3 14.5 14.5 13.5	11,100 90,400 163,700 104,400 10,000,000 13,600,400 10,746,900
MCDONNELL DOUGLAS	RT	LONG	50.4 50.4 47.3 47.3 44.1 37.8 31.5 25.2	3,872 2,186 4,588 4,660 6,137 10,278 38,122 295,724
ROHR INDUSTRIES	RT	LONG	40.0 30.0 30.0 27.7 25.0 25.0 25.0 20.0 20.0 20.0	13,000 57,000 32,000 80,000 294,000 776,000 1,008,000 6,839,000 1,824,000 1,156,000
MCDONNELL DOUGLAS, CA	RT	LONG	20.0 20.0 19.0 19.0 19.0 19.0 18.5 18.0 18.0 16.0 14.0	54,000 140,700 200,600 10,000,000 250,700 2,635,300 101,000 10,000,000 10,000,000 10,000,000
AIR FORCE	RT	LONG	38.0 35.0 34.1 28.7 26.0 20.7 19.1	3,500 6,000 10,500 15,600 20,500 314,700 2,000,000
NORTHROP	RT	LONG	25.0 23.0 22.0 21.0 20.0	62,410 150,250 106,340 1,013,700 3,000,000

(*): RUN OUT

(#): BROKE IN GRIP AREA

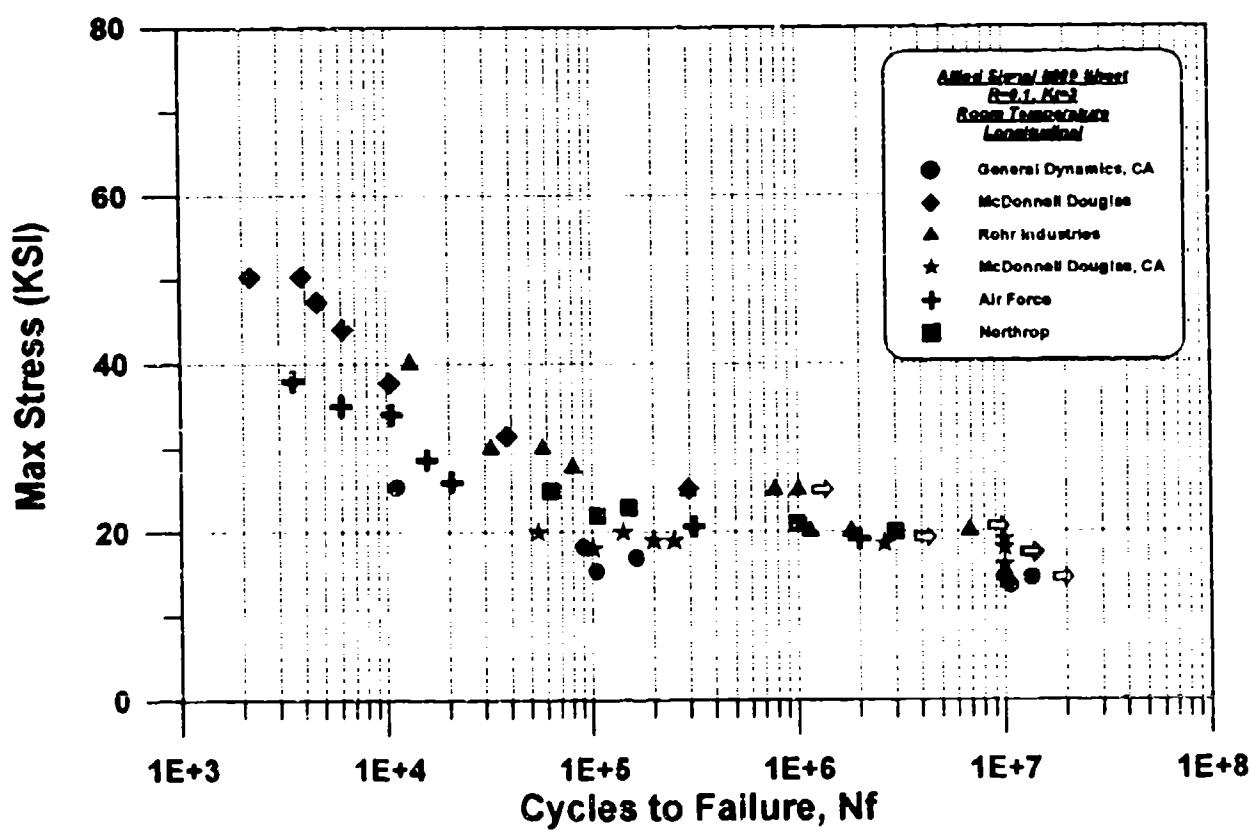


FIGURE A5. FATIGUE RESULTS FOR 8009 SHEET
(LONGITUDINAL, ROOM TEMPERATURE, Kt=3).

TABLE A53

FATIGUE RESULTS WITH R=0.1 AND Kt=3.0 FOR
ALLIED SIGNAL FVS0812 (8009) SHEET (0.090" THICK)

COMPANY	TEST TEMPERATURE (DEGREES F)	ORIENTATION	STRESS (KSI)	CYCLES
GENERAL DYNAMICS, CA	450	LONG	15.0 14.1 13.3 12.9 12.4 12.0 11.8 8.0	58,400 134,100 364,400 169,800 220,400 259,500 10,012,600 10,000,750
MCDONNELL DOUGLAS	450	LONG	30.1 30.1 24.1 24.1 20.1 20.1 16.0 16.0	23,383 23,507 88,717 54,050 135,456 209,852 1,000,000 989,458
ROHR INDUSTRIES	450	LONG	25.0 15.0 20.0 15.0 15.0 20.0 20.0 25.0 30.0 30.0	68,800 1,000,000 167,800 1,000,000 1,000,000 197,000 144,800 55,400 19,000 16,900
AIR FORCE	450	LONG	40.0 30.0 19.6 21.2 19.3 15.7 17.3 15.3	2,500 13,300 28,600 39,600 63,100 130,500 137,100 1,260,000

(*): RUN OUT

(#): BROKE OUTSIDE OF NOTCH

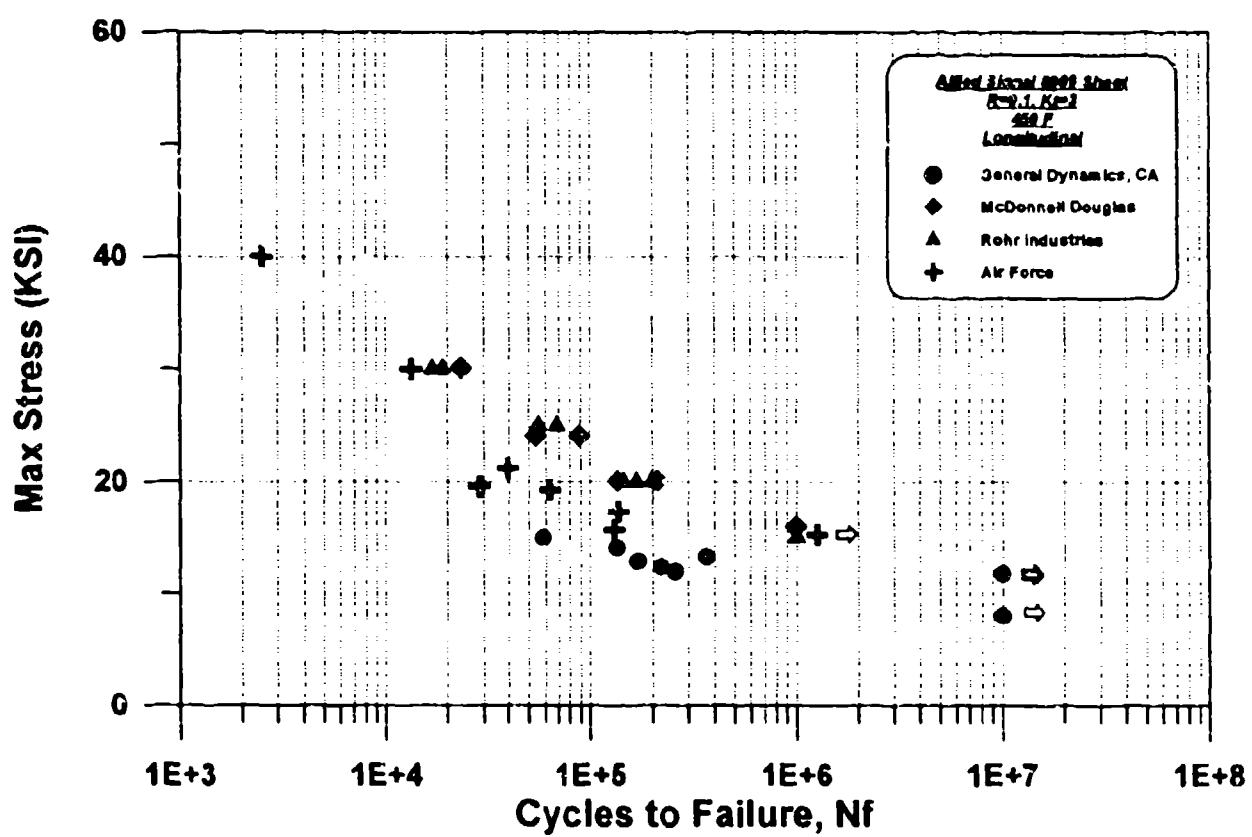


FIGURE A6. FATIGUE RESULTS FOR 8009 SHEET
(LONGITUDINAL, 450 F, Kt=3).

TABLE A54
FATIGUE RESULTS WITH R=0.1 AND KT=3.0 FOR
ALLIED SIGNAL FVS0812 (8009) SHEET (0.090" THICK)

COMPANY	TEST TEMPERATURE (DEGREES F)	ORIENTATION	STRESS (KSI)	CYCLES
GENERAL DYNAMICS, CA	600	LONG	14.8 11.5 10.0 9.2 8.3 8.0 7.5 6.6	84,400 156,000 215,300 10,003,900 454,500 10,016,000 7,603,000 10,000,000
MCDONNELL DOUGLAS	600	LONG	19.7 19.7 18.5 18.5 18.2 17.9 17.9	77,624 50,203 92,086 106,995 265,516 1,000,000 1,000,000
ROHR INDUSTRIES	600	LONG	20.0 20.0 15.0 15.0 15.0 12.5 12.5 10.0 10.0 10.0	74,300 82,500 301,500 302,300 514,200 1,000,000 858,000 1,000,000 1,000,000 1,000,000
AIR FORCE	600	LONG	33.6 21.8 18.7 14.6 12.1 11.9	4,200 19,700 55,200 665,400 967,300 2,015,000

(*): RUN OUT

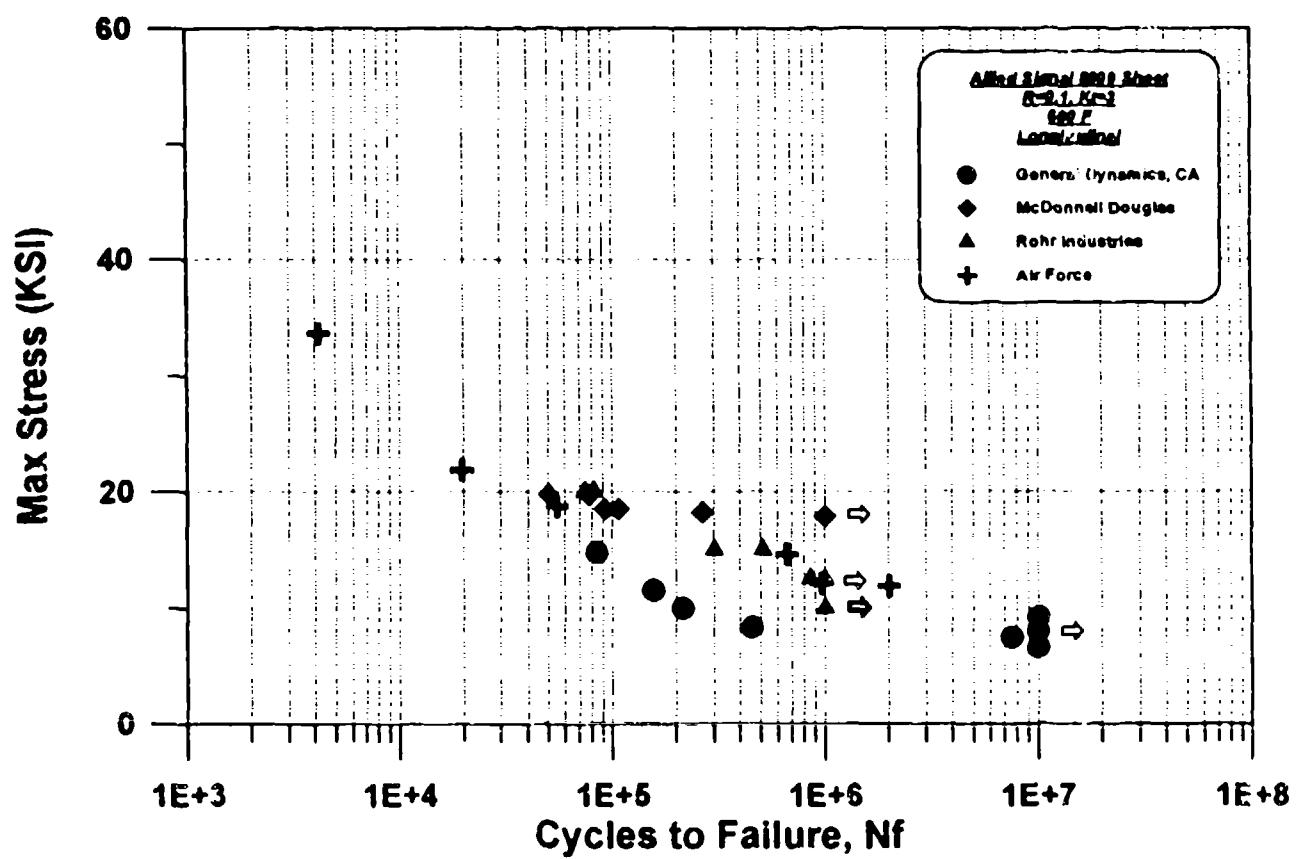


FIGURE A7. FATIGUE RESULTS FOR 8009 SHEET
(LONGITUDINAL, 600 F, Kt=3).

TABLE A55

FATIGUE RESULTS WITH R=0.1 AND Kt=3.0 FOR
ALLIED SIGNAL FVS0812 (6009) SHEET (0.090" THICK)

COMPANY	TEST TEMPERATURE (DEGREES F)	ORIENTATION	STRESS (KSI)	CYCLES
MCDONNELL DOUGLAS	PT	L TRANS	44.1	2,609
			44.1	6,793
			41.2	11,422
			41.2	9,154
			38.2	13,076
			38.2	15,047
			28.2	52,738
			23.5	1,000,000 *

(*): RUN OUT

TABLE A56

FATIGUE RESULTS WITH R=0.1 AND Kt=3.0 FOR
ALLIED SIGNAL FVS0812 (8009) SHEET (0.090" THICK)

COMPANY	TEST TEMPERATURE (DEGREES F)	ORIENTATION	STRESS (KSI)	CYCLES
MCDONNELL DOUGLAS	450	L TRANS	22.6	78,908
			22.6	62,591
			21.9	110,815
			21.9	92,891
			19.3	372,003
			19.3	472,003
			18.3	1,000,000
			18.3	1,000,000

(*): RUN OUT

TABLE A57
FATIGUE RESULTS WITH R=0.1 AND Kt=3.0 FOR
ALLIED SIGNAL FVS0812 (8009) SHEET (0.090" THICK)

COMPANY	TEST TEMPERATURE (DEGREES F)	ORIENTATION	STRESS (KSI)	CYCLES
MCDONNELL DOUGLAS	600	L TRANS	25.3	58,558
			25.3	76,109
			24.0	65,783
			24.0	72,733
			21.5	194,949
			21.5	143,872
			19.0	1,000,000
			19.0	1,000,000 *

(*): RUN OUT

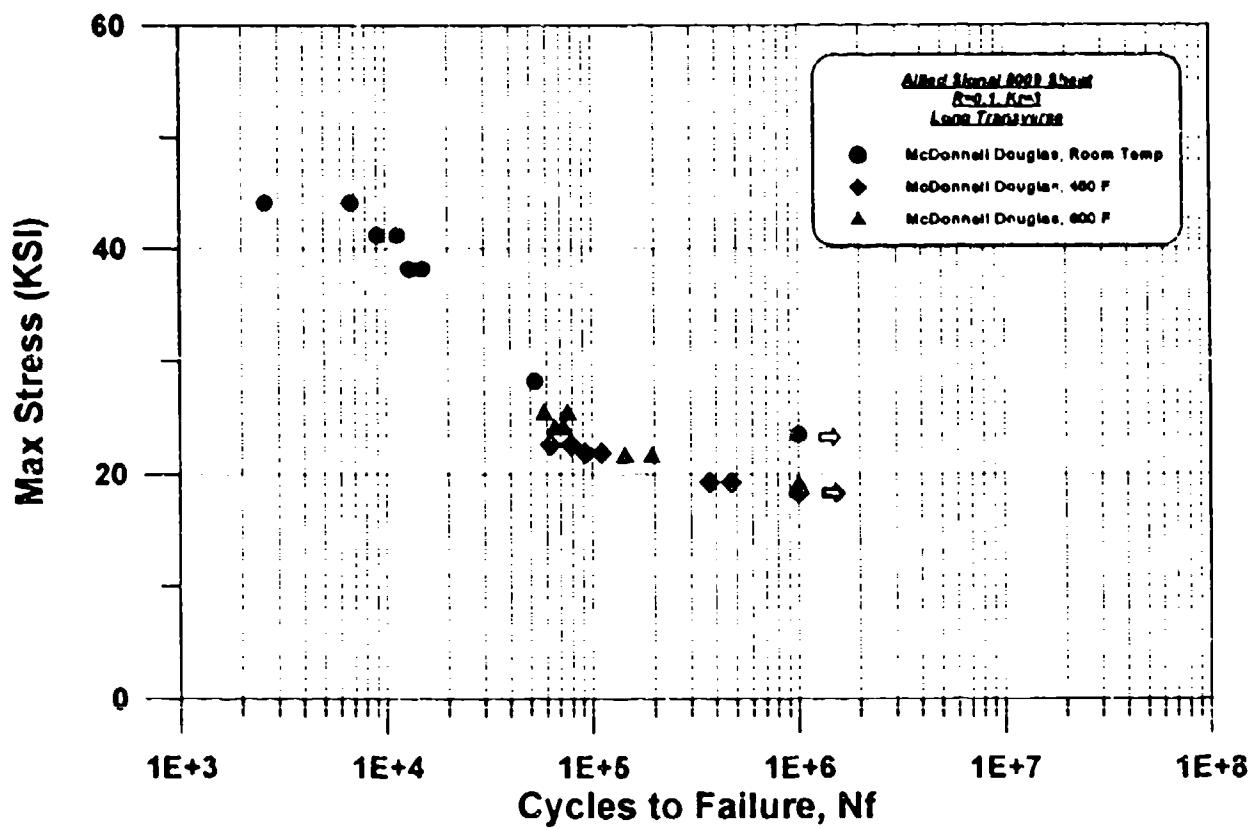


FIGURE AB. FATIGUE RESULTS FOR 8009 SHEET
(LONG TRANSVERSE, $K_t=3$)
MCDONNELL DOUGLAS.

TABLE A58

FATIGUE RESULTS WITH R=0.1 AND Kt=3.0 FOR
ALLIED SIGNAL FVS0812 (8009) SHEET (0.090" THICK)

COMPANY	TEST TEMPERATURE (DEGREES F)	ORIENTATION	STRESS (KSI)	CYCLES
MCDONNELL DOUGLAS, CA	300	LONG	20.0	74,200
			16.0	204,200
			16.0	205,700
			12.0	390,300
			11.0	2,649,900
			10.0	10,000,000
			8.0	10,000,000

(*): RUN OUT

TABLE A59

FATIGUE RESULTS WITH R=0.1 AND Kt=1.0 FOR
ALLIED SIGNAL FVS0812 (8009) SHEET (0.090" THICK)
AFTER 100 HRS @ 450F

COMPANY	TEST TEMPERATURE (DEGREES F)	ORIENTATION	STRESS (KSI)	CYCLES
NORTHROP	450	LONG	40.0	145,322
			38.0	234,575
			35.0	98,899
			32.0	442,850
			30.0	1,000,000

(*): RUN-OUT

TABLE A60

FATIGUE RESULTS WITH R=0.1 AND Kt=3.0 FOR
ALLIED SIGNAL FVS0812 (8009) SHEET (0.090" THICK)

COMPANY	TEST TEMPERATURE (DEGREES F)	ORIENTATION	STRESS (KSI)	CYCLES
NORTHROP	450	LONG	25.0	73,648
			20.0	171,384
			15.0	317,361
			14.0	1,000,000
			12.0	1,000,000

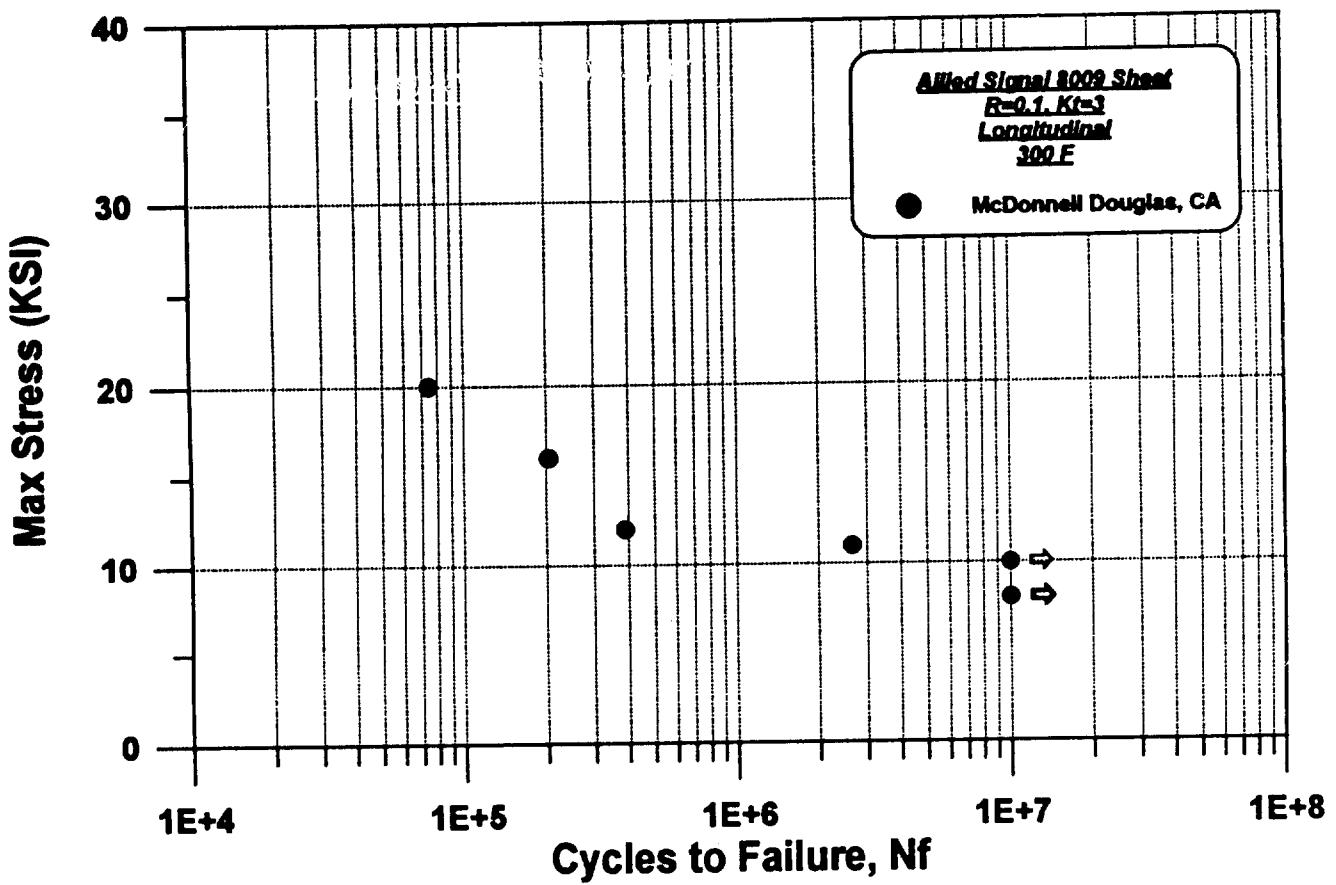


FIGURE A9. FATIGUE RESULTS FOR 8009 SHEET
(LONGITUDINAL, 300 F, Kt=3)
MCDONNELL DOUGLAS.

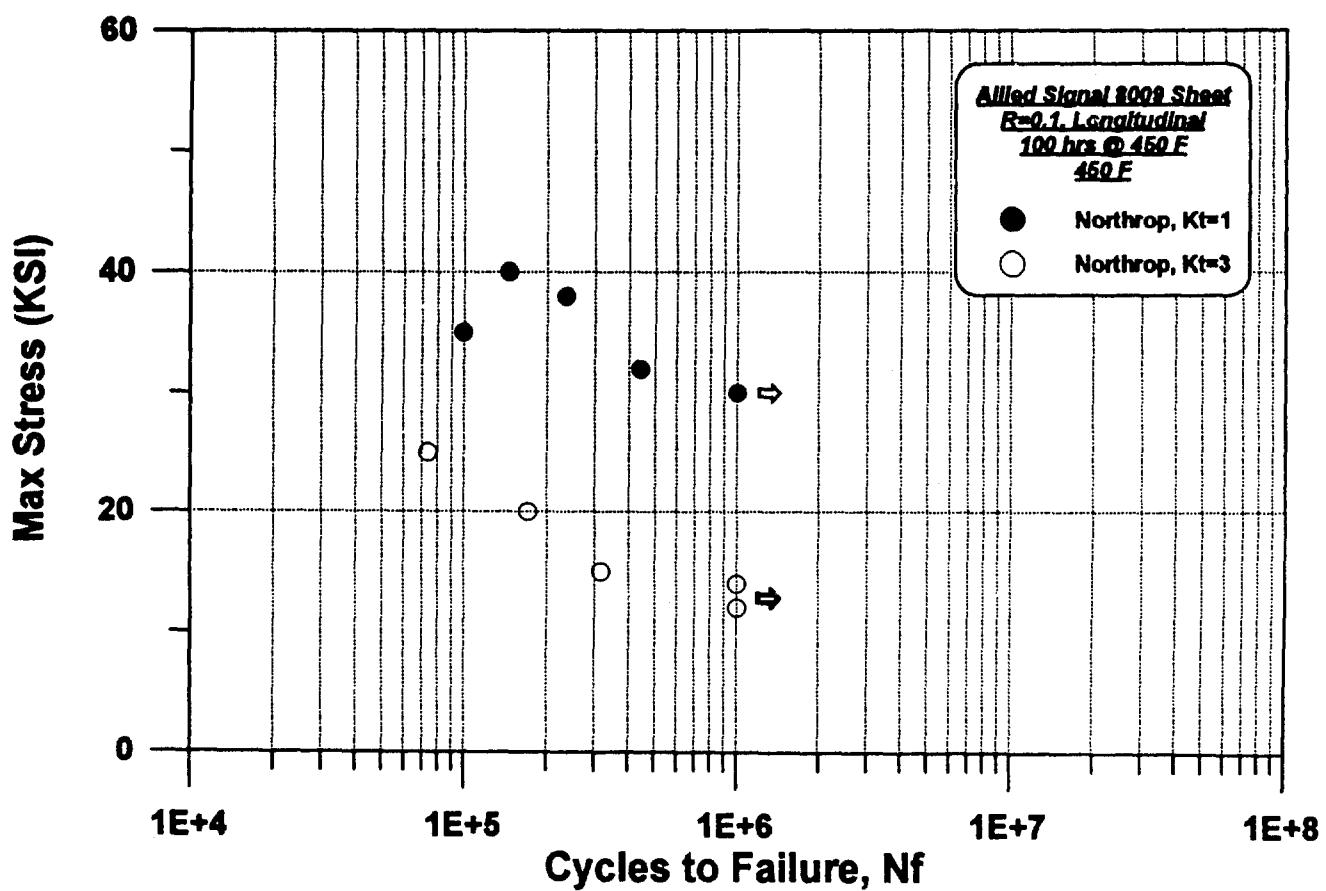
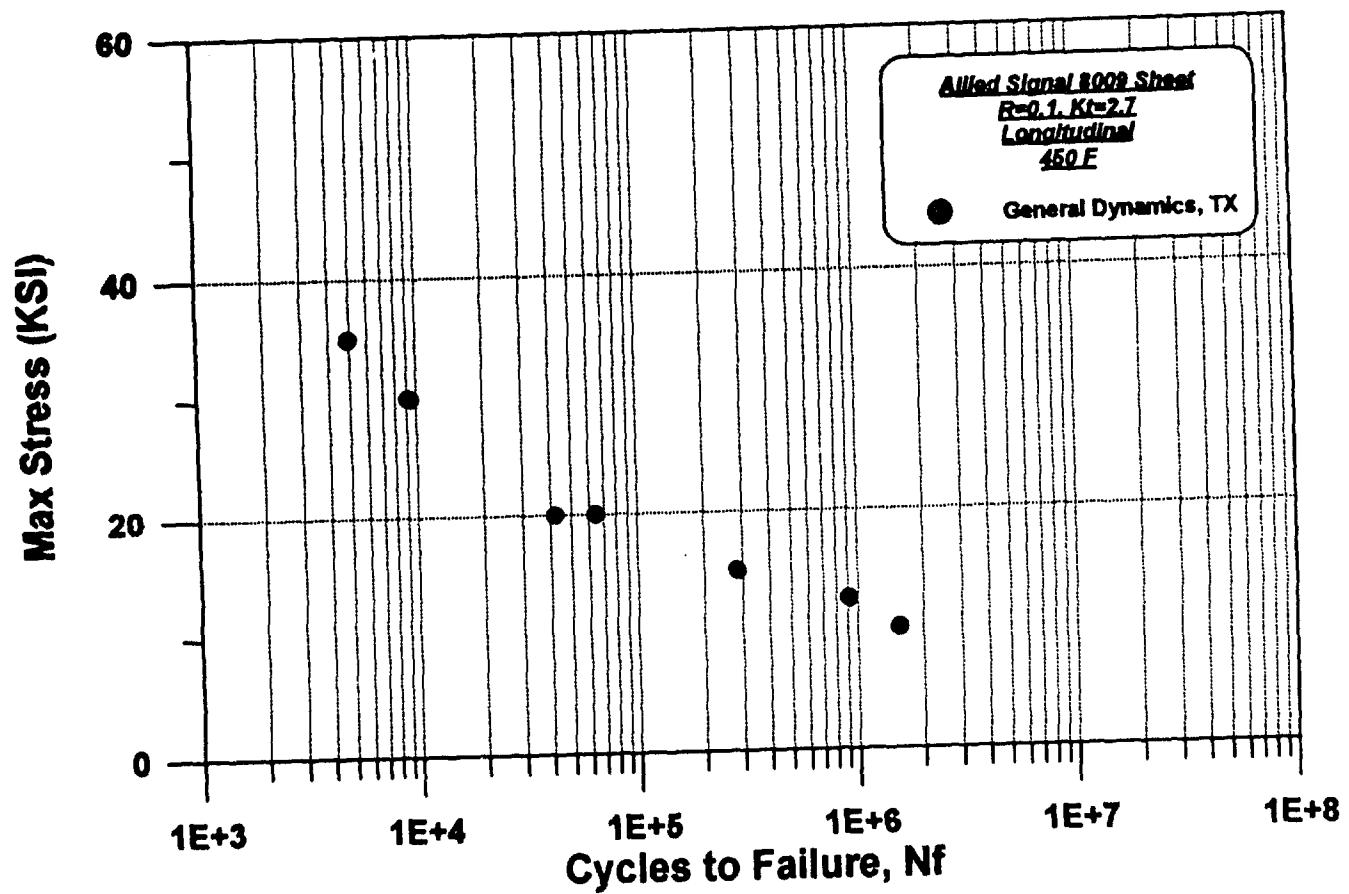


FIGURE A10. FATIGUE RESULTS FOR 8009 SHEET
(LONGITUDINAL, 100 HRS @ 450 F, 450 F)
NORTHROP.

TABLE A61
FATIGUE RESULTS WITH R=0.1 AND Kt=2.7 FOR
ALLIED SIGNAL FVS0812 (8009) SHEET (0.090" THICK)

COMPANY	TEST TEMPERATURE (DEGREES F)	ORIENTATION	STRESS (KSI)	CYCLES
GENERAL DYNAMICS, TX	150	LONG	35.0	4,939
			30.0	9,140
			30.0	9,339
			20.0	42,200
			20.0	64,673
			15.0	333,749
			12.5	912,903
			10.0	1,554,906

(*): RUN OUT



**FIGURE A11. FATIGUE RESULTS FOR 8009 SHEET
(LONGITUDINAL, 450 F, $K_t=2.7$)
GENERAL DYNAMICS, TX.**

R-CURVE TEST

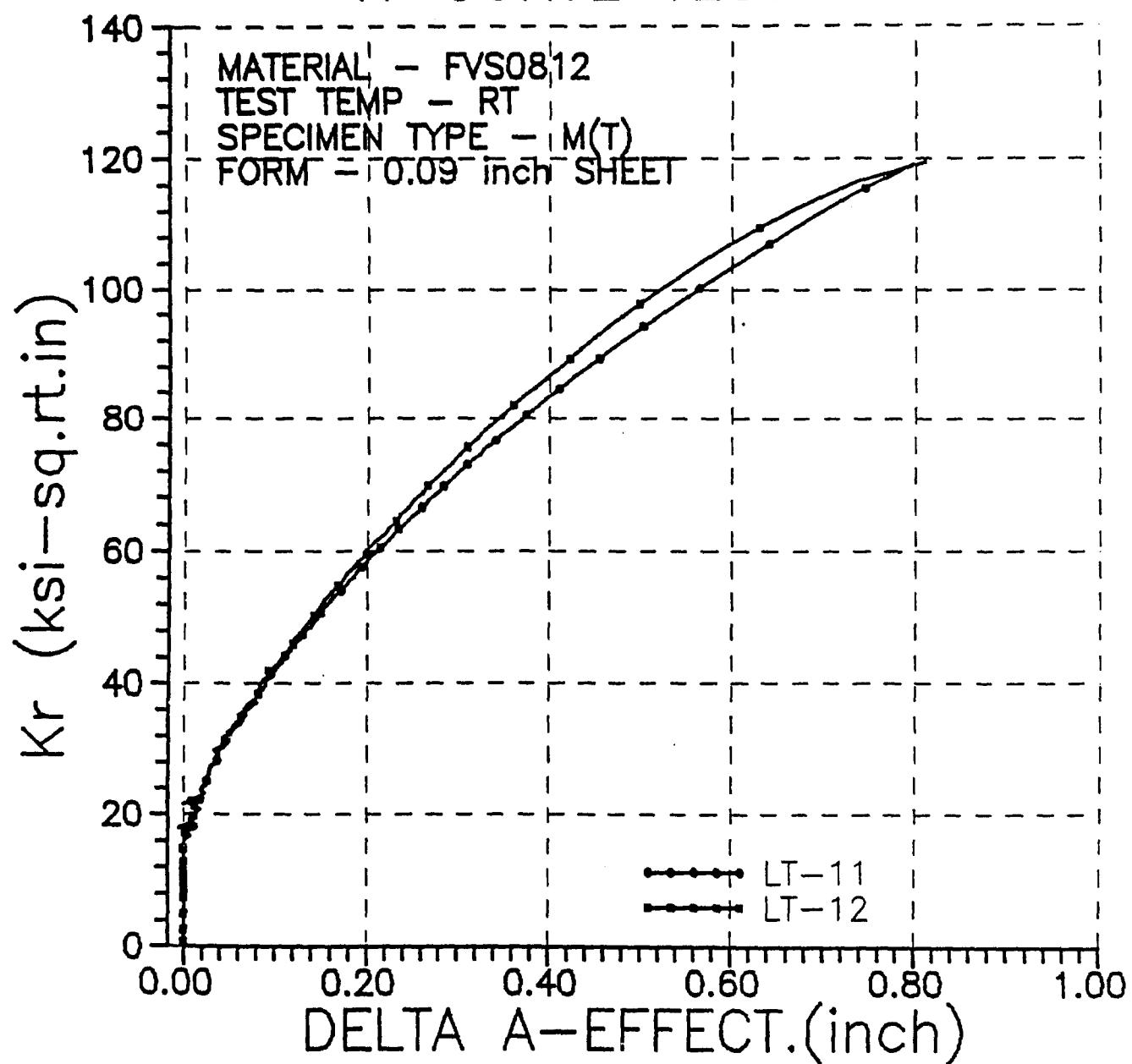


FIGURE A12. R-CURVE RESULTS OF 8009 SHEET
(L-T ORIENTATION, ROOM TEMPERATURE)
AIR FORCE.

R-CURVE TEST

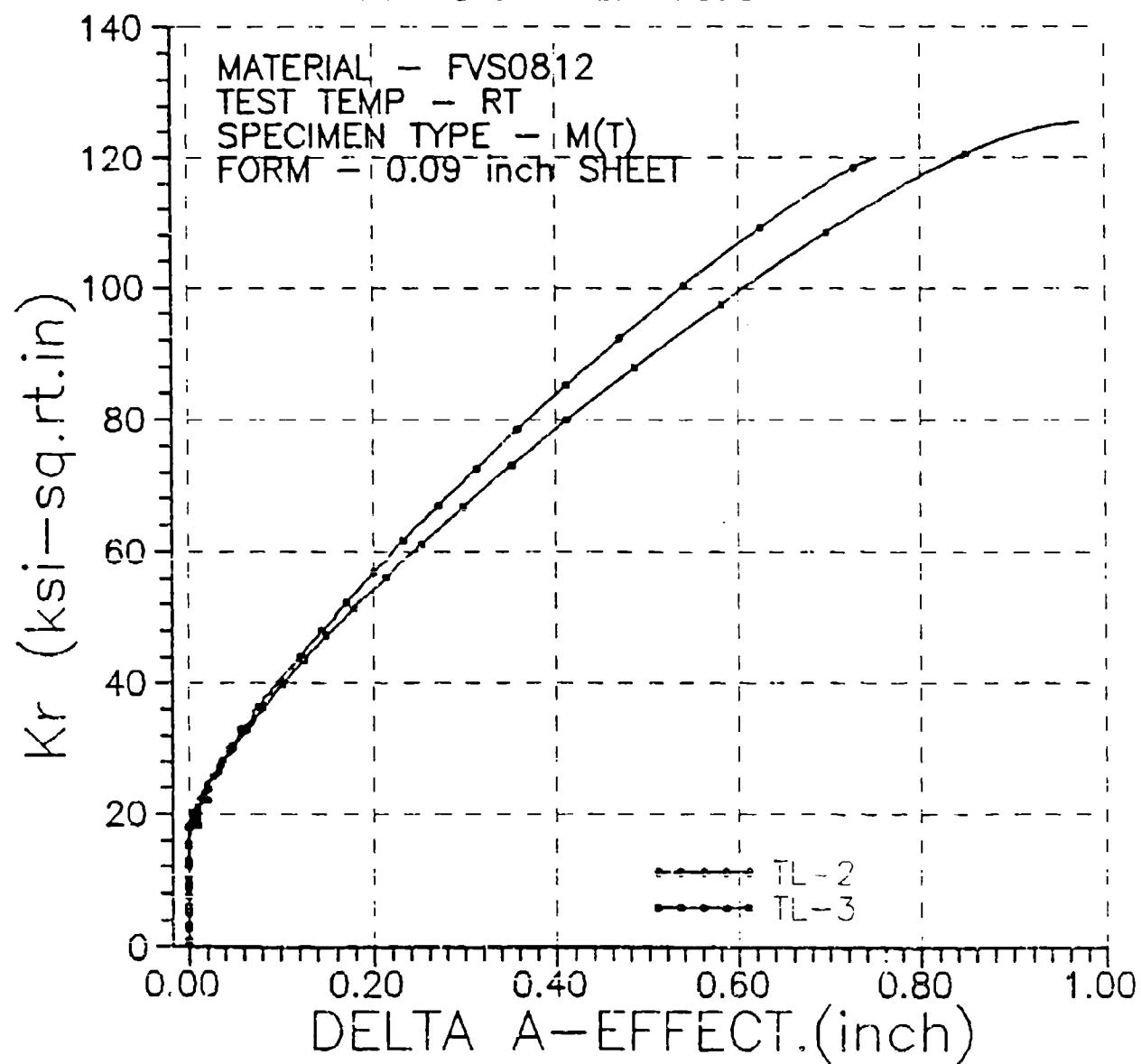


FIGURE A13. R-CURVE RESULTS OF 8009 SHEET
(T-L ORIENTATION, ROOM TEMPERATURE)
AIR FORCE.

R-CURVE TEST

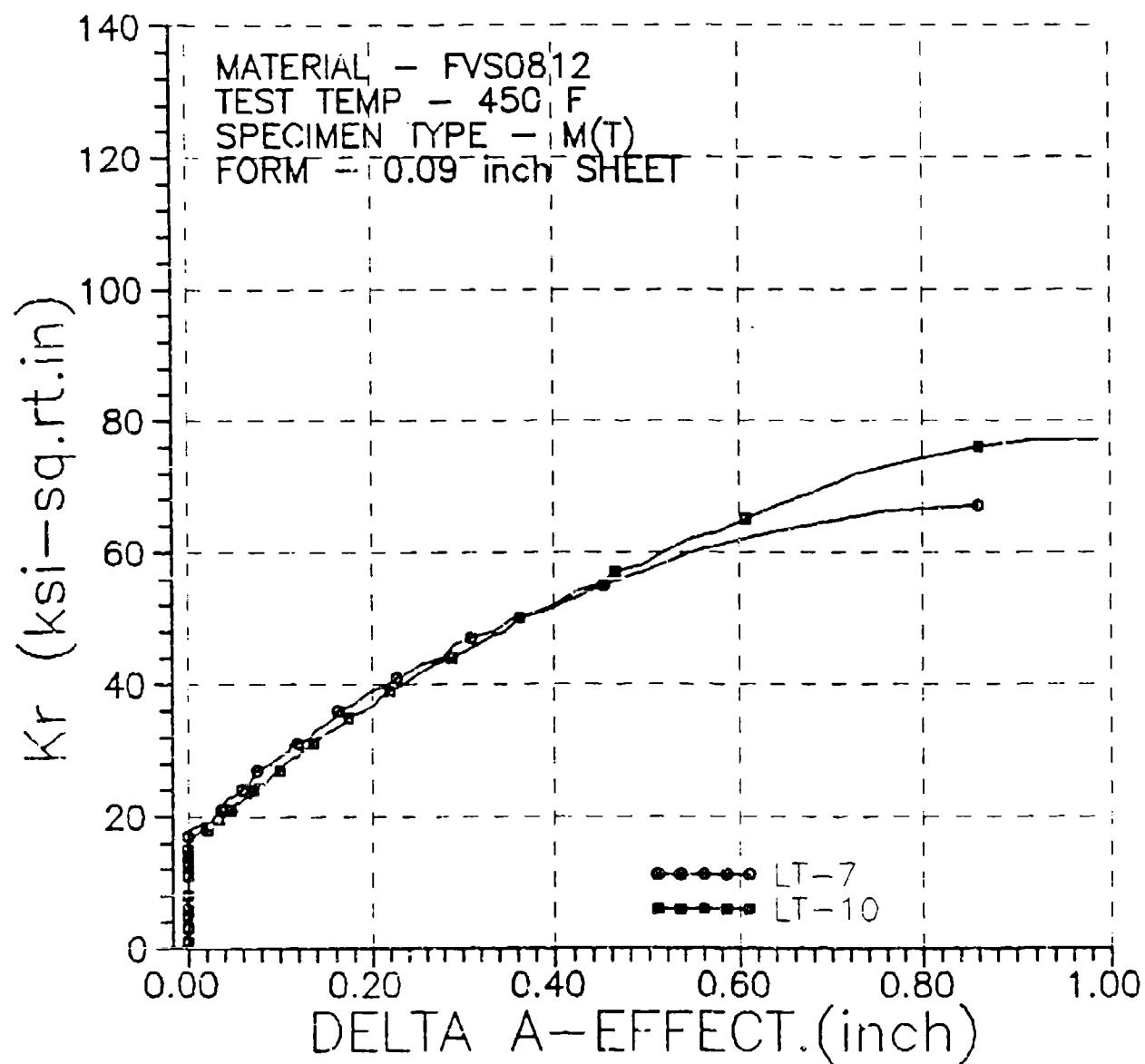


FIGURE A14. R-CURVE RESULTS OF 8009 SHEET
(L-T ORIENTATION, 450 F)
AIR FORCE.

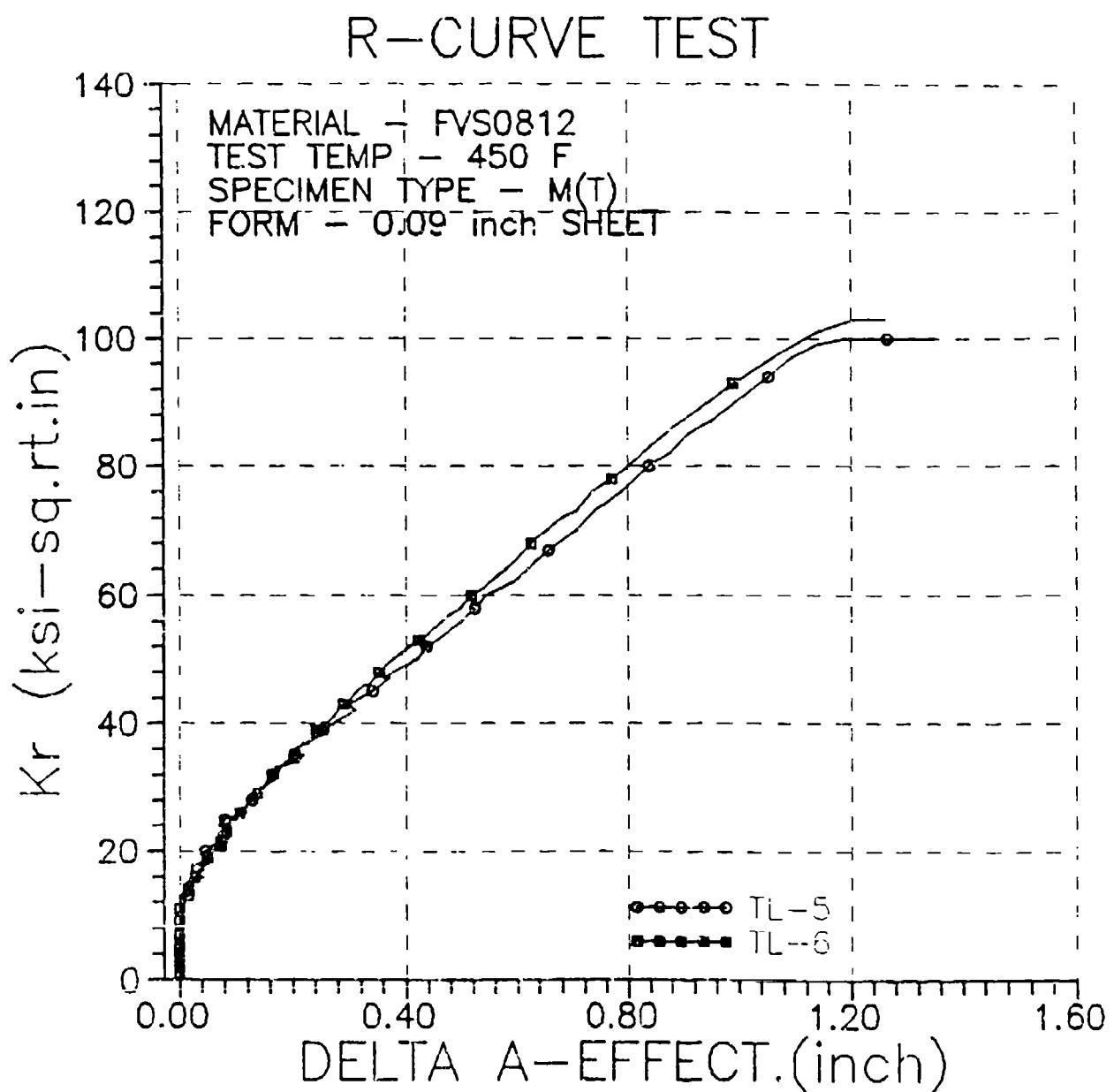


FIGURE A15. R-CURVE RESULTS OF 8009 SHEET
 (T-L ORIENTATION, 450 F)
 AIR FORCE.

R-CURVE TEST

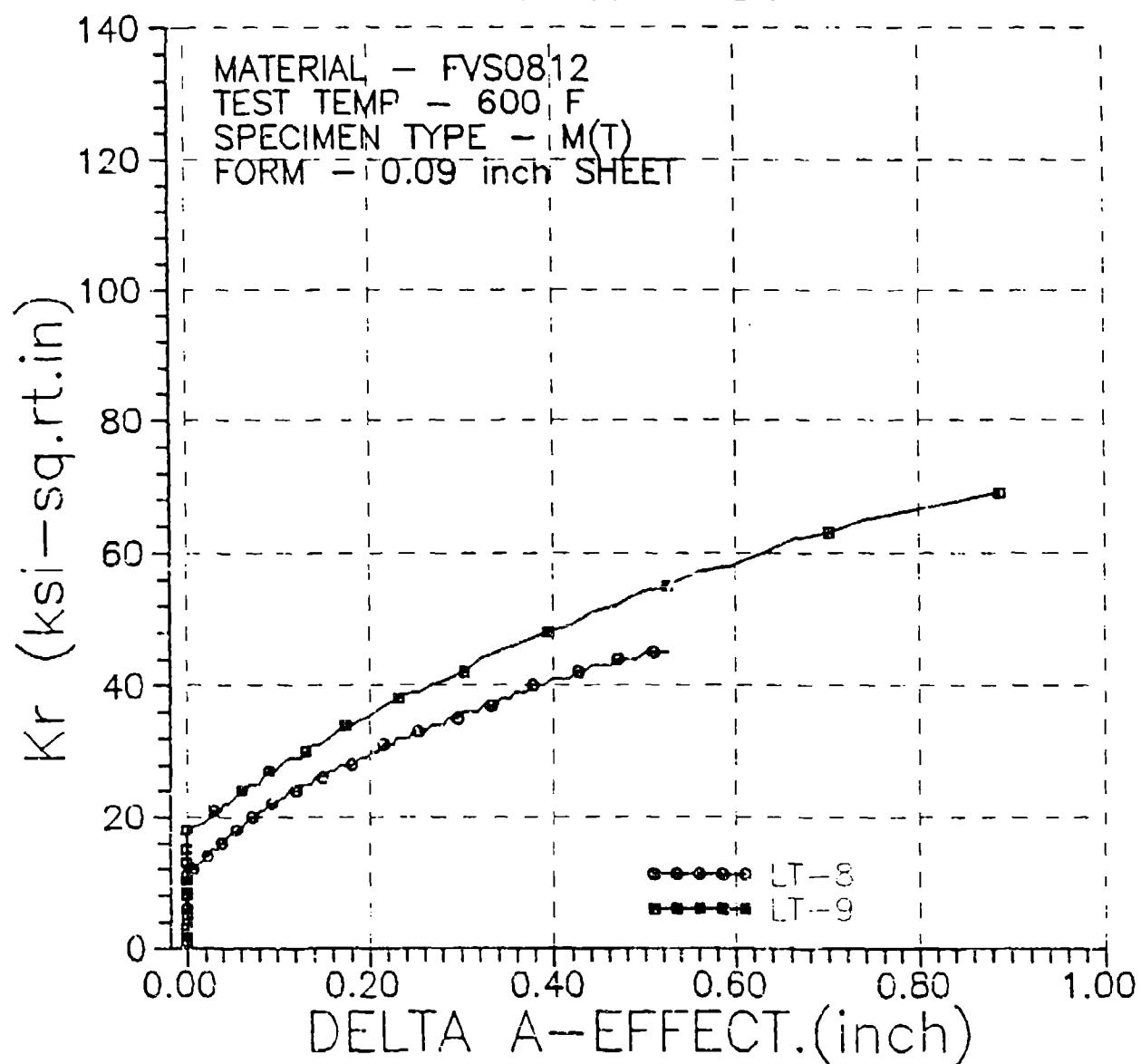


FIGURE A16. R-CURVE RESULTS OF 8009 SHEET
(L-T ORIENTATION, 600 F)
AIR FORCE.

R-CURVE TEST

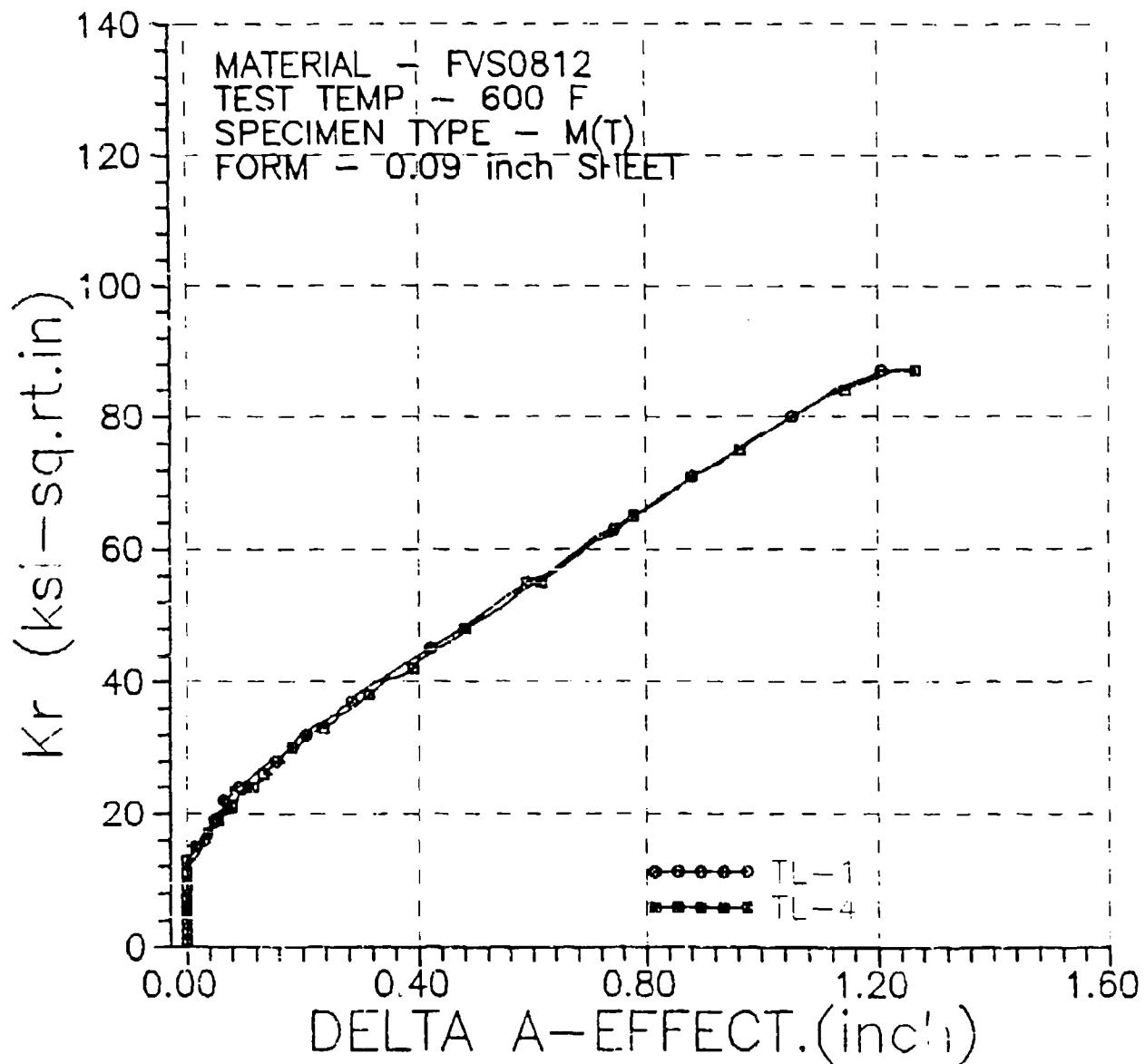


FIGURE A17. R-CURVE RESULTS OF 8009 SHEET
(T-L ORIENTATION, 600 F)
AIR FORCE.

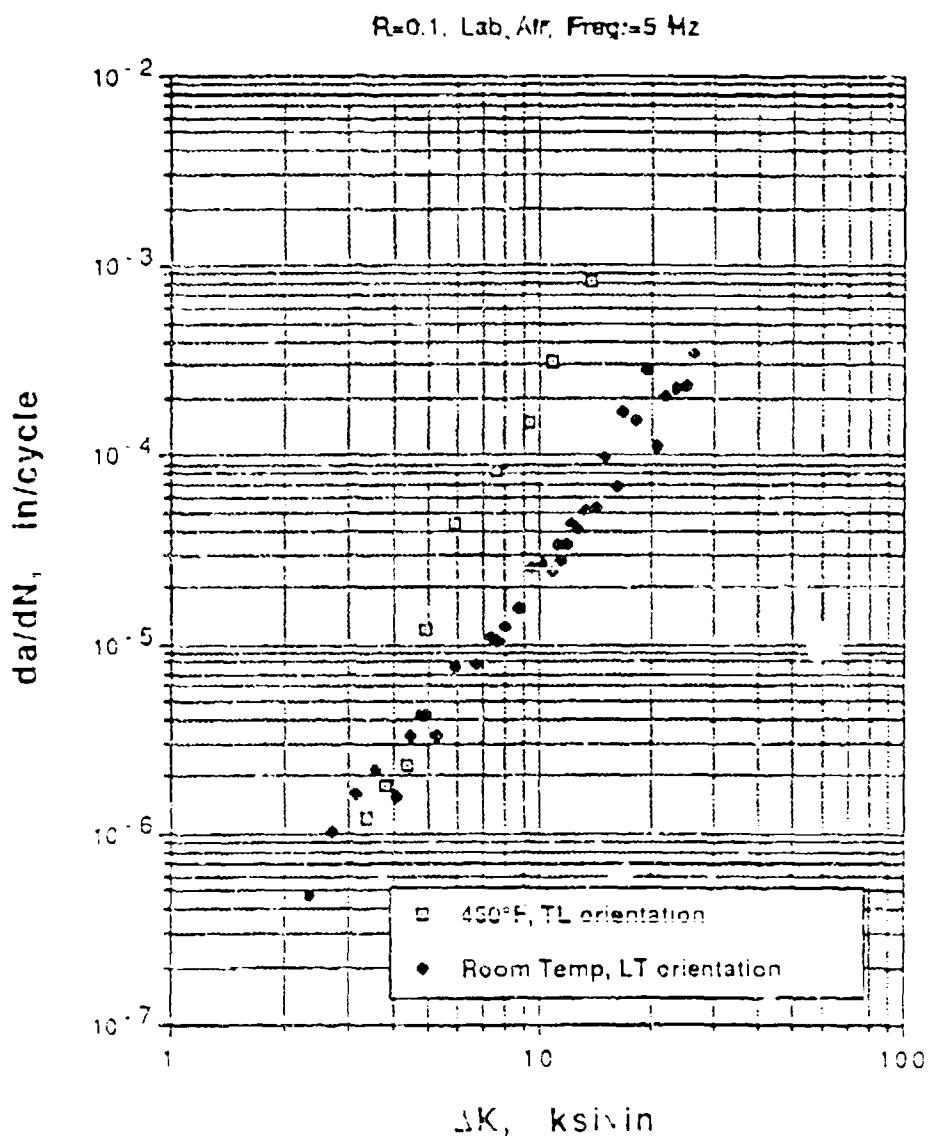


FIGURE A18. FATIGUE CRACK GROWTH RATE RESULTS OF 8009 SHEET
 (L-T ORIENTATION, ROOM TEMPERATURE;
 T-L ORIENTATION, 450°F), $R=0.1$, FREQ=5 Hz
 GENERAL DYNAMICS, TX.

15LT
Lab Air
Room Temp

5 Hz
R=0.1

da/dN	ΔK
2.77E-05	11.39
1.04E-05	7.61
4.21E-06	4.70
4.76E-07	2.32
1.02E-06	2.71
1.61E-06	3.16
2.15E-06	3.58
1.58E-06	4.05
3.24E-06	4.43
4.31E-06	4.86
3.28E-06	5.20
7.56E-06	5.95
7.92E-06	6.66
1.10E-05	7.37
1.24E-05	8.09
1.54E-05	8.79
2.50E-05	9.47
2.62E-05	10.24
2.43E-05	10.82
3.37E-05	11.27
3.36E-05	11.72
4.33E-05	12.20
4.07E-05	12.68
5.21E-05	13.38
5.36E-05	14.10
9.83E-05	14.97
6.85E-05	16.11
1.69E-04	18.00
1.56E-04	18.19
2.89E-04	19.37
1.12E-04	20.99
2.06E-04	22.63
2.30E-04	23.38
2.54E-04	24.87
2.43E-04	26.47

11TL

R=0.1
Lab Air
Tested at 450°F

da/dN	ΔK
2.79E-05	11.64
6.46E-06	7.84
1.80E-06	4.90
1.19E-06	3.36
1.77E-06	3.83
2.32E-06	4.33
1.21E-05	4.86
4.41E-05	5.87
8.38E-05	7.66
1.50E-04	9.32
3.16E-04	10.87
8.21E-04	13.52

TABLE A62. FATIGUE CRACK GROWTH RATE RESULTS OF 8009 SHEET
(L-T ORIENTATION, ROOM TEMPERATURE;
T-L ORIENTATION, 450°F), R=0.1, FREQ=5 Hz
GENERAL DYNAMICS, TX.

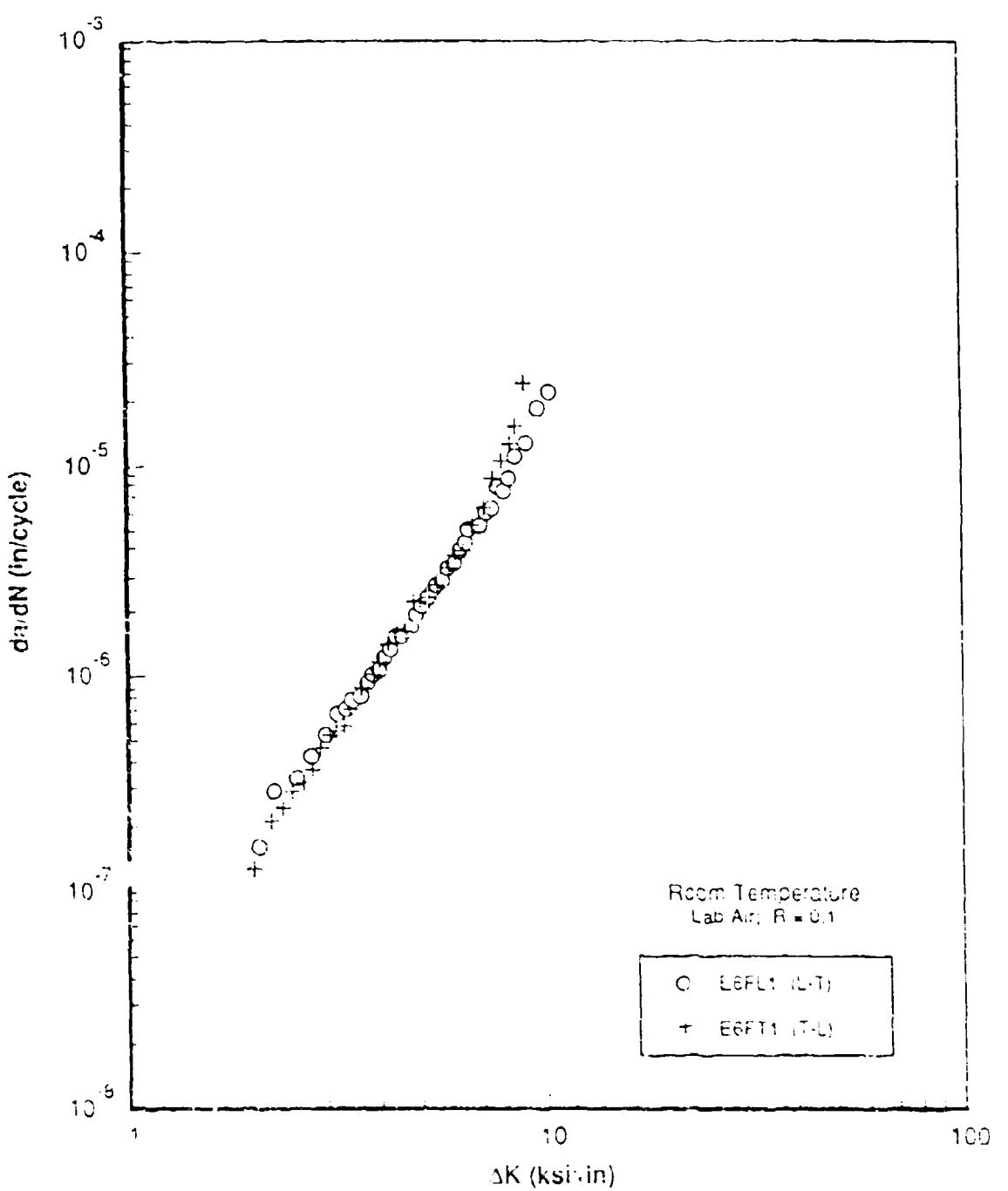


FIGURE A19. FATIGUE CRACK GROWTH RATE RESULTS OF 8009 SHEET
(L-T AND T-L ORIENTATIONS, ROOM TEMPERATURE)
 $R=0.1$, NORTHROP.

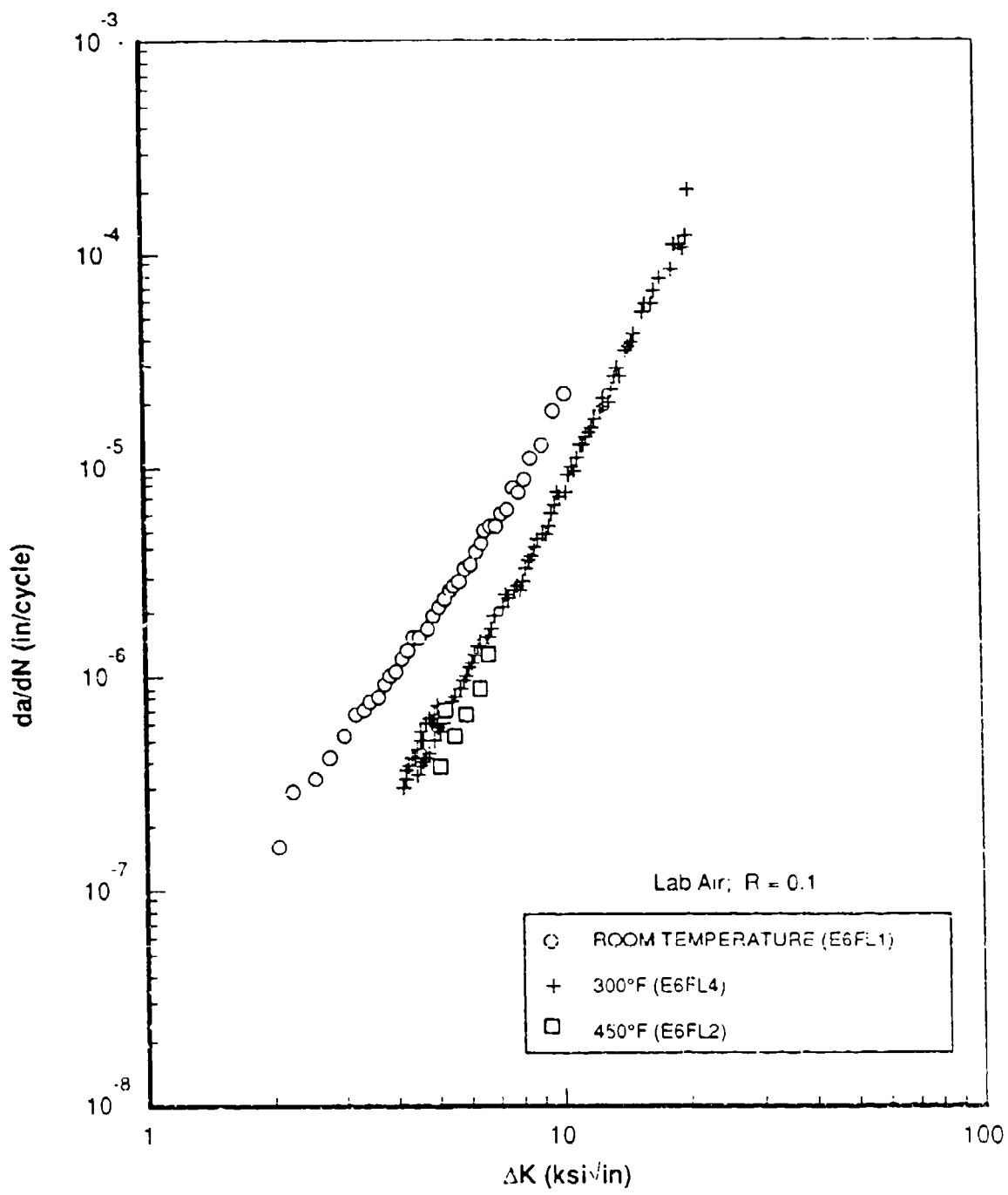


FIGURE A20. FATIGUE CRACK GROWTH RATE RESULTS OF 8009 SHEET (L-T ORIENTATION, ROOM TEMPERATURE, 300°F, AND 450°F, $R=0.1$, NORTHROP.

CRACK GROWTH TEST OF 8009, .09" SHEET SPEC E6FL1
 K(T) SPECIMEN TYPE L-T ORIENTATION
 TEMP = 80 REL HUM = 55 % 07-NOV-91
 W = 3.001 IN B = .09 IN R = .1
 FREQUENCY = 10 HZ LAB. AIR ENVIRONMENT
 GRID SPACING = .03 IN FILE CODE: RKL:800566.DDN
 YIELD STRESS = .64 KSI FITO CODE: RKL:800566.DFO

SPECIMEN E6FL1				K(T) SPECIMEN TYPE		PAGE 2	
REF #	K-MAX	2A IN	2A/W	K-BAR	DELTA K-BAR	DA/DN IN/CYC	VALID PER ASTM
1	2.24	.2312	.077	2.3	2.07	1.57051E-07	Y
2	2.36	.2557	.0832	2.49	2.24	2.92500E-07	Y
3	2.62	.3142	.1047	2.81	2.53	3.03942E-07	Y
4	2.99	.4057	.1352	3.07	2.76	4.21875E-07	Y
5	3.14	.4462	.1487	3.3	2.97	5.40625E-07	Y
6	3.45	.5327	.1775	3.34	3.19	6.66667E-07	Y
7	3.63	.5847	.1948	3.71	3.34	7.10937E-07	Y
8	3.79	.6302	.21	3.86	3.47	7.59259E-07	Y
9	3.92	.6712	.2237	4	3.6	8.01723E-07	Y
10	4.08	.7177	.2392	4.16	3.75	9.37501E-07	Y
11	4.25	.7702	.2566	4.32	3.89	1.02174E-06	Y
12	4.4	.8172	.2723	4.46	4.02	1.05263E-06	Y
13	4.53	.8572	.2854	4.6	4.14	1.23611E-06	Y
14	4.67	.9017	.3003	4.74	4.27	1.32353E-06	Y
15	4.81	.9467	.3155	4.89	4.41	1.36230E-06	Y
16	4.99	.9967	.3321	5.05	4.54	1.53371E-06	Y
17	5.12	1.0397	.3465	5.24	4.74	1.70192E-06	Y
18	5.41	1.1282	.3739	5.49	4.94	1.93834E-06	Y
19	5.57	1.1752	.3916	5.65	5.08	2.13636E-06	Y
20	5.73	1.2222	.4073	5.81	5.23	2.37500E-06	Y
21	5.89	1.2697	.4231	5.98	5.38	2.55556E-06	Y
22	6.06	1.3157	.4384	6.14	5.53	2.63888E-06	Y
23	6.23	1.3632	.4542	6.32	5.69	2.77778E-06	Y
24	6.42	1.4132	.4709	6.52	5.87	3.28125E-06	Y
25	6.62	1.4657	.4884	6.71	6.04	3.35714E-06	Y
26	6.81	1.5127	.5041	6.92	6.23	3.94429E-06	Y
27	7.04	1.5682	.5226	7.15	6.43	4.20835E-06	Y
28	7.26	1.6187	.5394	7.26	6.63	4.79999E-06	Y
29	7.47	1.6687	.5554	7.59	6.83	5.04999E-06	Y
30	7.71	1.7172	.5722	7.81	7.03	5.23001E-06	Y
31	7.91	1.7592	.5862	8.03	7.23	5.87501E-06	Y
32	8.15	1.8082	.6019	8.28	7.46	6.25001E-06	Y
33	8.42	1.8562	.6183	8.55	7.69	7.74997E-06	Y
34	8.68	1.9027	.6304	8.81	7.93	7.50001E-06	Y
35	8.95	1.9477	.6449	9.11	8.2	8.58333E-06	Y
36	9.27	1.9992	.6662	9.49	8.54	1.10000E-05	Y
37	9.72	2.0652	.6882	10.1	9.09	1.26250E-05	Y
38	10.5	2.1662	.7218	10.8	9.72	1.76251E-05	Y
39	11.12	2.2367	.7453	11.56	10.4	2.20000E-05	Y
40	12.02	2.3247	.7746				

TABLE A63. FATIGUE CRACK GROWTH RATE RESULTS OF 8009 SHEET
 (L-T ORIENTATION, ROOM TEMPERATURE) R=0.1
 SPECIMEN # E6FL1, NORTHROP.

CRACK GROWTH TEST OF 8009 .07" SHEET SPEC E6FT1
 R(T) SPECIMEN TYPE T-L ORIENTATION
 TEMP = 77 REL HUM = 43 % 26-NOV-91
 W = 3.001 IN B = .091 IN R = .1
 FREQUENCY = 10 HZ LAB. AIR ENVIRONMENT
 GRID SPACING = .05 IN FILE CODE: RK1:800567.DDN
 YIELD STRESS = 62 KSI FITO CODE: RK1:800567.DFO

REF #	SPECIMEN E6FT1			R(T) SPECIMEN TYPE	PAGE 2		
	K-MAX	2A IN	2A/W		DELTA K-BAR	DA/DN IN/CYC	VALID PER ASTM
1	2.19	.2774	.0924	2.24	2.01	1.30000E-07	Y
2	2.29	.3034	.1011	2.43	2.19	2.08333E-07	Y
3	2.57	.3784	.1261	2.62	2.36	2.38462E-07	Y
4	2.67	.4094	.1364	2.76	2.45	2.38111E-07	Y
5	2.85	.4609	.1536	2.92	2.63	3.27464E-07	Y
6	3	.5074	.1671	3.07	2.76	3.72951E-07	Y
7	3.14	.5529	.1842	3.21	2.89	4.62963E-07	Y
8	3.29	.6029	.2009	3.37	3.03	3.41667E-07	Y
9	3.44	.6549	.2182	3.51	3.16	5.57524E-07	Y
10	3.58	.7019	.2339	3.64	3.28	5.77222E-07	Y
11	3.71	.7449	.2482	3.77	3.39	7.10937E-07	Y
12	3.84	.7904	.2634	4.04	3.64	8.73457E-07	Y
13	4.24	.9319	.3105	4.31	3.85	1.02273E-06	Y
14	4.37	.9789	.3255	4.44	4	1.17500E-06	Y
15	4.51	1.0239	.3412	4.64	4.18	1.40152E-06	Y
16	4.78	1.1164	.372	4.85	4.37	1.60000E-06	Y
17	4.92	1.1644	.388	5.11	4.6	1.50893E-06	Y
18	5.31	1.2899	.4298	5.41	4.87	2.19543E-06	Y
19	5.51	1.3314	.4503	5.6	5.04	2.27083E-06	Y
20	5.69	1.4059	.4635	5.82	5.24	2.34375E-06	Y
21	5.75	1.4804	.4733	6.17	5.55	2.75000E-06	Y
22	6.39	1.6017	.5338	6.52	5.87	3.20001E-06	Y
23	6.45	1.6639	.5551	6.77	6.09	3.71375E-06	Y
24	6.7	1.7234	.5749	7.1	6.39	3.34583E-06	Y
25	7.31	1.8187	.6061	7.47	6.74	5.21428E-06	Y
26	7.67	1.8917	.6304	7.87	7.03	6.16667E-06	Y
27	8.06	1.9657	.6531	8.31	7.48	8.44997E-06	Y
28	8.36	2.0304	.6832	8.74	7.83	1.02501E-05	Y
29	8.96	2.1119	.7037	9.13	8.22	1.21250E-05	Y
30	9.3	2.1604	.7197	9.53	8.53	1.35000E-05	Y
31	9.76	2.2204	.7399	9.96	8.76	2.32000E-05	Y
32	10.16	2.2674	.7553				

TABLE A64. FATIGUE CRACK GROWTH RATE RESULTS OF 8009 SHEET
 (T-L ORIENTATION, ROOM TEMPERATURE) R=0.1
 SPECIMEN # E6FT1, NORTHROP.

**AUTOMATED FATIGUE CRACK
GROWTH RATE ANALYSIS**

Specimen Id.	E6FL4-a	Geometry	M(T)
Contract #	WB01778N	Orientation	L-T
Material	8009 SHEET	Yield (ksi)	48.4
Temperature (F)	300	Modulus	10.4
Environment			

Specimen Dimensions (in)

Thickness	0.092	Notch depth	0.314
Width	1.500	Gage length	0.200
Height	0.000	Alpha ratio	1.000

Precrack Parameters

Pmax (lbs)	1500.0	Stress ratio (R)	0.10
Final a (in)	0.327	Kmax	5.68

Test Parameters

Initial a (in)	0.410	Initial K	4.60
K-gradient	3.00	Stress ratio (R)	0.10

K Coeff	EvB/P Coeff	Analysis Codes
	-1.617860	KRC 2 0
	22.795000	
	-61.236481	
	37.816212	
	40.309029	
	-41.208481	

Visual Observations

EvB/P	Crack (EvB/P)	Crack (visual)	Error	CAF
0.60	0.410	0.384	-.026	1.000
0.62	0.421	0.395	-.026	1.000
0.66	0.444	0.425	-.019	1.000
0.67	0.453	0.439	-.014	1.000
0.69	0.468	0.460	-.008	1.000
0.69	0.468	0.462	-.006	1.000
0.72	0.481	0.480	-.001	1.000
0.76	0.506	0.512	0.006	1.000
0.81	0.540	0.559	0.019	1.000
0.87	0.571	0.602	0.031	1.000

Comments

Date of test: 12-3-91

**TABLE A65. FATIGUE CRACK GROWTH RATE RESULTS OF 8009 SHEET
(L-T ORIENTATION, 300 F) R=0.1
SPECIMEN # E6FL4, NORTHROP.**

Pnum. (lbs)	E8B/P	a (in)	N (X1)	Δa (in)	ΔN (X1)	Δa/ΔN (in/cyc)	ΔK (ksi/in)
		0.61	0.4123	23936			
1129	0.62	0.4190	42830	0.0140	39680	3.535E-07	4.44
1141	0.63	0.4263	63615	0.0135	35517	3.805E-07	4.53
1153	0.64	0.4325	78347	0.0124	30340	4.075E-07	4.62
1165	0.65	0.4387	93955	0.0130	30419	4.275E-07	4.71
1176	0.66	0.4455	108766	0.0122	27018	4.533E-07	4.80
1189	0.67	0.4509	120973	0.0122	24255	5.050E-07	4.89
1201	0.68	0.4577	133021	0.0134	23456	5.734E-07	4.98
1213	0.69	0.4644	144429	0.0125	22023	5.679E-07	5.08
1225	0.70	0.4702	155044	0.0113	18536	6.109E-07	5.17
1237	0.71	0.4757	162965	0.0110	15651	7.046E-07	5.26
1249	0.72	0.4813	170695	0.0119	16591	7.171E-07	5.36
1262	0.73	0.4876	179556	0.0128	16640	7.702E-07	5.45
1274	0.74	0.4941	187335	0.0117	14345	8.171E-07	5.55
1288	0.75	0.4993	193900	0.0117	13129	8.879E-07	5.66
1301	0.76	0.5057	200464	0.0127	13128	9.707E-07	5.76
1316	0.77	0.5121	207028	0.0127	12483	1.020E-06	5.87
1329	0.78	0.5185	212946	0.0117	10504	1.110E-06	5.97
1342	0.79	0.5237	217532	0.0106	9209	1.155E-06	6.08
1356	0.79	0.5291	222155	0.0122	9597	1.269E-06	6.19
1370	0.81	0.5359	227129	0.0131	9199	1.419E-06	6.30
1385	0.82	0.5422	231354	0.0120	8066	1.492E-06	6.42
1400	0.83	0.5479	235195	0.0116	7682	1.506E-06	6.53
1414	0.84	0.5537	239036	0.0117	7499	1.565E-06	6.65
1430	0.85	0.5597	242694	0.0127	7499	1.692E-06	6.78
1445	0.86	0.5664	246535	0.0131	6777	1.936E-06	6.90
		0.87	0.5728	249471			
		0.88	0.5782	252020			
1493	0.89	0.5840	255141	0.0127	5916	2.150E-06	7.29
1508	0.90	0.5909	257937	0.0119	4937	2.404E-06	7.41
1523	0.91	0.5959	260078	0.0097	4223	2.309E-06	7.54
1539	0.92	0.6006	262160	0.0116	4598	2.525E-06	7.68
1555	0.93	0.6075	264676	0.0137	5135	2.663E-06	7.81
1573	0.95	0.6143	267294	0.0126	4817	2.617E-06	7.96
1591	0.96	0.6201	269494	0.0118	4112	2.960E-06	8.12
1609	0.97	0.6261	271407	0.0122	3697	3.305E-06	8.26
1625	0.98	0.6323	273191	0.0118	3304	3.578E-06	8.41
1643	0.99	0.6379	274711	0.0112	2996	3.725E-06	8.56
1660	1.00	0.6435	276187	0.0114	2806	4.046E-06	8.71
1676	1.01	0.6492	277516	0.0113	2495	4.520E-06	8.85
1695	1.02	0.6548	278682	0.0120	2603	4.621E-06	9.02
1713	1.03	0.6613	280119	0.0129	2758	4.665E-06	9.18
1733	1.05	0.6676	281440	0.0125	2373	5.252E-06	9.35
1752	1.06	0.6737	282492	0.0117	2023	5.793E-06	9.52
1772	1.07	0.6794	283463	0.0119	1805	6.583E-06	9.70
1791	1.08	0.6856	284297	0.0124	1704	7.274E-06	9.87
1811	1.09	0.6917	285168	0.0124	1739	7.101E-06	10.06
1831	1.11	0.6980	286037	0.0122	1622	7.528E-06	10.25

TABLE A65. FATIGUE CRACK GROWTH RATE RESULTS OF 8009 SHEET
(L-T ORIENTATION, 300 F) R=0.1
SPECIMEN # E6FL4, NORTHROP. (continued)

Prob.	E&B/P (1bs)	a (in)	N (X1)	Δa (in)	ΔN (X1)	Δa/ΔN (in/cyc)	ΔK (ksf/in)
1852	1.12	0.7040	286789	0.0123	1385	8.850E-06	10.44
1871	1.13	0.7102	287422	0.0114	1154	9.875E-06	10.61
1889	1.14	0.7154	287943	0.0096	1025	9.394E-06	10.79
1909	1.15	0.7199	288447	0.0107	1000	1.071E-05	10.97
1926	1.16	0.7261	288943	0.0115	950	1.210E-05	11.14
1949	1.18	0.7314	289397	0.0121	993	1.224E-05	11.36
1970	1.19	0.7382	289935	0.0136	1013	1.341E-05	11.56
1991	1.21	0.7449	290410	0.0117	844	1.390E-05	11.77
2017	1.22	0.7499	290779	0.0123	824	1.487E-05	12.02
2036	1.23	0.7572	291234	0.0131	802	1.631E-05	12.22
2061	1.24	0.7630	291581	0.0116	654	1.775E-05	12.46
2081	1.26	0.7688	291887	0.0111	542	2.043E-05	12.67
2096	1.27	0.7741	292122	0.0075	391	1.915E-05	12.82
2121	1.27	0.7763	292278	0.0098	503	1.948E-05	13.07
2143	1.29	0.7839	29625	0.0168	746	2.248E-05	13.29
2172	1.31	0.7930	293024	0.0165	638	2.580E-05	13.59
2197	1.33	0.8003	293263	0.0109	362	2.839E-05	13.86
2221	1.34	0.8039	293406	0.0088	335	2.611E-05	14.12
2246	1.35	0.8091	293598	0.0138	409	3.375E-05	14.38
2268	1.37	0.8177	293815	0.0145	410	3.548E-05	14.62
2298	1.38	0.8236	294008	0.0121	323	3.763E-05	14.95
2325	1.40	0.8298	294138	0.0132	327	4.025E-05	15.24
	1.42	0.8368	294335				
	1.43	0.8422	294465				
2400	1.43	0.8437	294550	0.0120	233	5.177E-05	16.08
2419	1.46	0.8542	294697	0.0178	316	5.634E-05	16.30
2457	1.48	0.8615	294865	0.0145	260	5.585E-05	16.74
2482	1.50	0.8687	294957	0.0116	175	6.620E-05	17.03
2517	1.51	0.8731	295040	0.0131	176	7.471E-05	17.45
	1.53	0.8819	295133				
	1.56	0.8932	295275				
2629	1.58	0.8977	295361	0.0140	168	8.328E-05	18.80
2652	1.60	0.9072	295443	0.0154	144	1.066E-04	19.09
2685	1.62	0.9130	295505	0.0112	101	1.105E-04	19.52
2711	1.63	0.9183	295544	0.0104	99	1.056E-04	19.85
2744	1.65	0.9234	295604	0.0142	120	1.189E-04	20.28
2783	1.67	0.9325	295664	0.0207	104	1.998E-04	20.60
	1.71	0.9441	295707				

TABLE A65. FATIGUE CRACK GROWTH RATE RESULTS OF 8009 SHEET
(L-T ORIENTATION, 300 F) R=0.1
SPECIMEN # E6FL4, NORTHROP. (continued)

SPECIMEN E6FL2			M (T) SPECIMEN TYPE			PAGE 2		
REF #	K-MAX	2A IN	2A/W	K-BAR	DELTA K-BAR	DA/DN IN/CYC	VALID FER ASTM	
1	5.54	.738	.2461		5.64	5.08	3.89931E-07	Y
2	5.75	.788	.2628		5.83	5.25	7.08382E-07	Y
3	5.91	.824	.2748		6.1	5.49	5.40138E-07	Y
4	6.29	.914	.3048		6.52	5.87	6.64477E-07	Y
5	6.75	1.02	.3401		7.06	6.36	8.97121E-07	Y
6	7.38	1.162	.3875		7.48	6.73	1.28307E-06	Y
7	7.57	1.204	.4015					

**TABLE A66. FATIGUE CRACK GROWTH RATE RESULTS OF 8009 SHEET
(L-T ORIENTATION, 450 F) R=0.1
SPECIMEN # E6FL2, NORTHROP.**

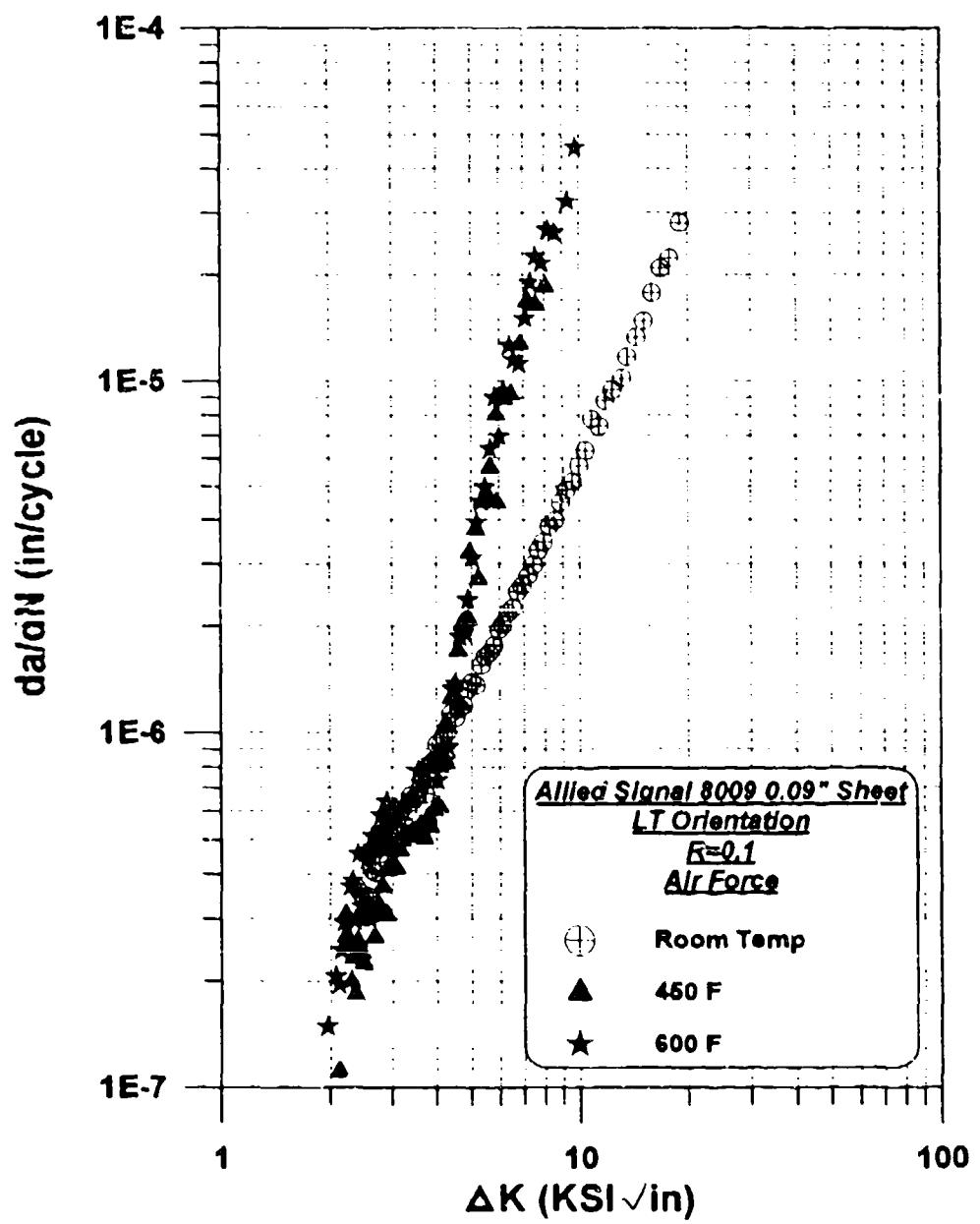


FIGURE A21. FATIGUE CRACK GROWTH RATE RESULTS OF 8009 SHEET
(L-T ORIENTATION, ROOM TEMPERATURE, 450 F, AND 600 F)
R=0.1, AIR FORCE

Room Temperature Delta K	da/dN	450 F Delta K	da/dN	600 F Delta K	da/dN
2.38	3.61E-07	5.9	4.43E-06	1.97	1.49E-07
2.44	3.53E-07	5.6	4.65E-06	2.07	2.06E-07
2.5	3.44E-07	5.23	2.71E-06	2.11	1.95E-07
2.56	3.45E-07	4.9	2.10E-06	2.15	2.44E-07
2.62	4.10E-07	4.6	1.20E-06	2.19	2.92E-07
2.68	4.04E-07	4.26	8.19E-07	2.23	2.53E-07
2.75	4.55E-07	4.07	6.17E-07	2.27	3.69E-07
2.81	4.75E-07	3.77	5.75E-07	2.31	3.51E-07
2.87	4.80E-07	3.54	5.16E-07	2.35	2.94E-07
2.94	5.55E-07	3.35	6.34E-07	2.4	4.53E-07
3.01	4.77E-07	3.14	4.63E-07	2.45	3.23E-07
3.08	5.47E-07	3.05	5.59E-07	2.49	4.53E-07
3.15	6.00E-07	2.96	5.02E-07	2.54	4.36E-07
3.23	5.47E-07	2.89	3.06E-07	2.58	4.62E-07
3.3	6.00E-07	2.76	4.79E-07	2.63	5.11E-07
3.38	6.63E-07	2.67	2.66E-07	2.68	4.66E-07
3.46	6.58E-07	2.58	3.04E-07	2.73	5.12E-07
3.54	6.88E-07	2.49	2.24E-07	2.78	5.85E-07
3.62	7.17E-07	2.42	2.96E-07	2.83	5.32E-07
3.71	6.71E-07	2.35	1.84E-07	2.89	6.38E-07
3.8	7.70E-07	2.27	2.50E-07	2.94	5.85E-07
3.89	8.32E-07	2.21	3.07E-07	3	5.97E-07
3.98	9.26E-07	2.12	1.11E-07	3.06	6.04E-07
4.08	9.24E-07	2.22	2.68E-07	3.12	5.97E-07
4.18	5.66E-07	2.29	1.99E-07	3.19	6.20E-07
4.29	1.00E-06	2.32	2.32E-07	3.25	6.26E-07
4.39	1.13E-06	2.4	2.58E-07	3.38	6.54E-07
4.51	1.10E-06	2.45	2.41E-07	3.45	6.56E-07
4.63	1.17E-06	2.53	2.98E-07	3.53	7.77E-07
4.75	1.19E-06	2.59	3.21E-07	3.6	7.18E-07
4.88	1.32E-06	2.65	3.13E-07	3.68	7.76E-07
5.01	1.38E-06	2.75	3.25E-07	3.75	8.10E-07
5.15	1.36E-06	2.81	3.67E-07	3.85	8.25E-07
5.3	1.55E-06	2.89	4.08E-07	3.93	8.07E-07
5.45	1.64E-06	2.97	4.17E-07	4.02	7.32E-07
5.61	1.00E-06	3.07	4.14E-07	4.12	8.94E-07
5.77	1.76E-06	3.17	4.97E-07	4.22	8.32E-07
5.95	1.95E-06	3.26	5.11E-07	4.32	9.08E-07
6.13	2.02E-06	3.36	5.18E-07	4.43	1.33E-06
6.32	2.18E-06	3.46	5.22E-07	4.54	1.37E-06
6.52	2.25E-06	3.59	5.47E-07	4.65	1.86E-06
6.73	2.50E-06	3.69	5.03E-07	4.77	1.91E-06
6.95	2.60E-06	3.83	5.42E-07	4.9	2.36E-06
7.18	2.78E-06	3.94	6.06E-07	5.04	3.12E-06
7.43	2.98E-06	4.07	8.00E-07	5.18	3.93E-06
7.69	3.28E-06	4.24	1.05E-06	5.33	4.50E-06
7.96	3.46E-06	4.4	1.25E-06	5.48	4.98E-06
8.25	3.84E-06	4.58	1.70E-06	5.55	6.41E-06
8.56	3.98E-06	4.75	2.04E-06	5.82	8.99E-06
8.88	4.49E-06	4.95	3.21E-06	6.01	6.95E-06
9.23	4.86E-06	5.14	3.75E-06	6.2	9.37E-06
9.59	5.15E-06	5.38	4.52E-06	6.39	1.26E-05
9.98	5.71E-06	5.63	5.67E-06	6.5	1.15E-05
10.41	6.33E-06	5.89	8.01E-06	6.83	1.12E-05
10.86	7.79E-06	6.19	8.88E-06	7.07	1.50E-05
11.34	7.45E-06	6.48	9.16E-06	7.32	1.90E-05
11.86	8.76E-06	6.86	1.27E-05	7.59	2.25E-05
12.42	9.46E-06	7.2	1.68E-05	7.88	2.15E-05
13.2	1.02E-05	7.59	1.64E-05	8.2	2.67E-05
13.67	1.17E-05	8.06	1.85E-05	8.55	2.63E-05
14.36	1.33E-05	7.2	1.68E-05	9.31	3.23E-05
15.16	1.48E-05	7.59	1.64E-05	9.77	4.57E-05
16	1.78E-05	8.06	1.85E-05		
16.93	2.09E-05				
17.96	2.23E-05				
19.15	2.81E-05				

TABLE A67. FATIGUE CRACK GROWTH RATE RESULTS FOR 8009 SHEET
(L-T ORIENTATION, ROOM TEMPERATURE, 450 F, AND 600 F)
R=0.1, AIR FORCE

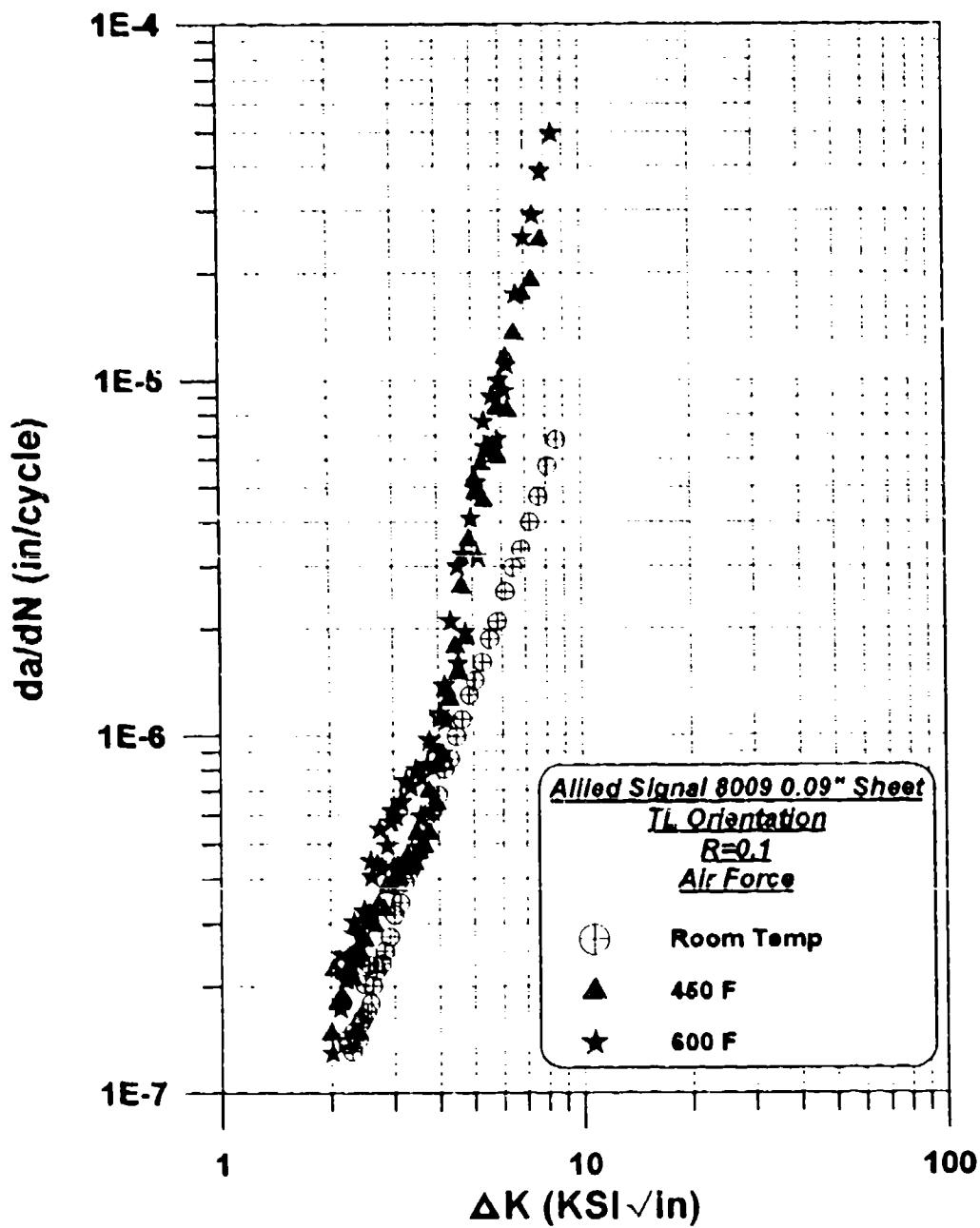


FIGURE A22. FATIGUE CRACK GROWTH RATE RESULTS OF 8009 SHEET
(T-L ORIENTATION, ROOM TEMPERATURE, 450 F, AND 600 F)
 $R=0.1$, AIR FORCE.

Alld Signal 8009 0.08" Sheet

R=0.1

T-L Orientation

Air Force

Room Temperature		450 F		600 F	
Delta K	da/dN	Delta K	da/dN	Delta K	da/dN
2.21	1.42E-07	6.28	8.19E-06	6.16	9.34E-06
2.23	1.37E-07	6.89	6.04E-06	5.86	6.77E-06
2.28	1.31E-07	8.4	4.57E-06	8.44	6.49E-06
2.3	1.40E-07	5.1	4.80E-06	5.18	3.19E-06
2.33	1.45E-07	4.77	1.88E-06	4.75	1.95E-06
2.37	1.42E-07	4.53	1.49E-06	4.54	1.59E-06
2.4	1.57E-07	4.2	1.34E-06	4.2	1.10E-06
2.43	1.62E-07	3.95	8.19E-07	4.02	1.15E-06
2.47	2.01E-07	3.78	6.97E-07	3.77	9.65E-07
2.51	1.69E-07	3.47	5.32E-07	3.56	5.94E-07
2.55	2.30E-07	3.26	4.61E-07	3.34	7.16E-07
2.57	1.79E-07	3.06	4.31E-07	3.14	6.47E-07
2.61	2.01E-07	2.89	3.88E-07	2.96	6.15E-07
2.67	2.11E-07	2.71	3.34E-07	2.73	5.48E-07
2.70	2.32E-07	2.54	2.96E-07	2.58	4.46E-07
2.62	2.51E-07	2.37	2.52E-07	2.41	2.60E-07
2.92	2.75E-07	2.25	2.24E-07	2.32	3.03E-07
3	3.18E-07	2.11	1.79E-07	2.14	2.45E-07
3.1	3.42E-07	2	1.47E-07	2.02	1.30E-07
3.21	3.90E-07	2.04	2.23E-07	2.12	1.73E-07
3.32	4.24E-07	2.09	1.80E-07	2.2	2.06E-07
3.43	4.67E-07	2.15	1.88E-07	2.27	2.52E-07
3.54	4.99E-07	2.2	2.18E-07	2.32	2.81E-07
3.68	5.93E-07	2.27	2.11E-07	2.39	2.77E-07
3.83	6.17E-07	2.34	2.34E-07	2.47	3.25E-07
3.97	6.81E-07	2.39	2.44E-07	2.53	3.16E-07
4.13	8.03E-07	2.48	2.68E-07	2.6	4.05E-07
4.28	8.58E-07	2.56	3.18E-07	2.69	4.39E-07
4.47	9.91E-07	2.63	2.96E-07	2.78	4.28E-07
4.65	1.11E-06	2.71	3.36E-07	2.87	4.93E-07
4.85	1.30E-06	2.8	3.29E-07	2.95	5.73E-07
5.05	1.43E-06	2.89	3.78E-07	3.04	5.92E-07
5.31	1.61E-06	2.97	4.23E-07	3.13	6.53E-07
5.56	1.87E-06	3.06	3.96E-07	3.23	7.43E-07
5.85	2.10E-06	3.19	4.40E-07	3.34	7.21E-07
6.14	2.54E-06	3.28	4.27E-07	3.45	8.00E-07
6.46	2.98E-06	3.41	4.38E-07	3.58	7.62E-07
6.8	3.35E-06	3.51	4.73E-07	3.71	8.26E-07
7.21	3.99E-06	3.65	4.30E-07	3.86	9.24E-07
7.63	4.69E-06	3.76	5.34E-07	4.04	1.12E-06
8.11	5.74E-06	3.93	6.40E-07	4.15	1.38E-06
8.59	6.78E-06	4.11	8.73E-07	4.34	2.10E-06
		4.28	1.28E-06	4.54	3.00E-06
		4.45	1.77E-06	4.7	3.22E-06
		4.64	2.62E-06	4.95	4.07E-06
		4.87	3.55E-06	5.15	5.15E-06
		5.07	5.21E-06	5.41	7.63E-06
		5.32	5.81E-06	5.68	9.02E-06
		5.6	6.34E-06	5.95	9.99E-06
		5.88	8.30E-06	6.26	1.10E-05
		6.22	1.16E-05	6.64	1.74E-05
		6.55	1.35E-05	7	2.51E-05
		6.94	1.74E-05	7.45	2.90E-05
		7.36	1.90E-05	7.86	3.85E-05
		7.83	2.47E-05	8.42	4.93E-05

TABLE A68. FATIGUE CRACK GROWTH RATE RESULTS FOR 8009 SHEET
(T-L ORIENTATION, ROOM TEMPERATURE, 450 F, AND 600 F)

R=0.1, AIR FORCE

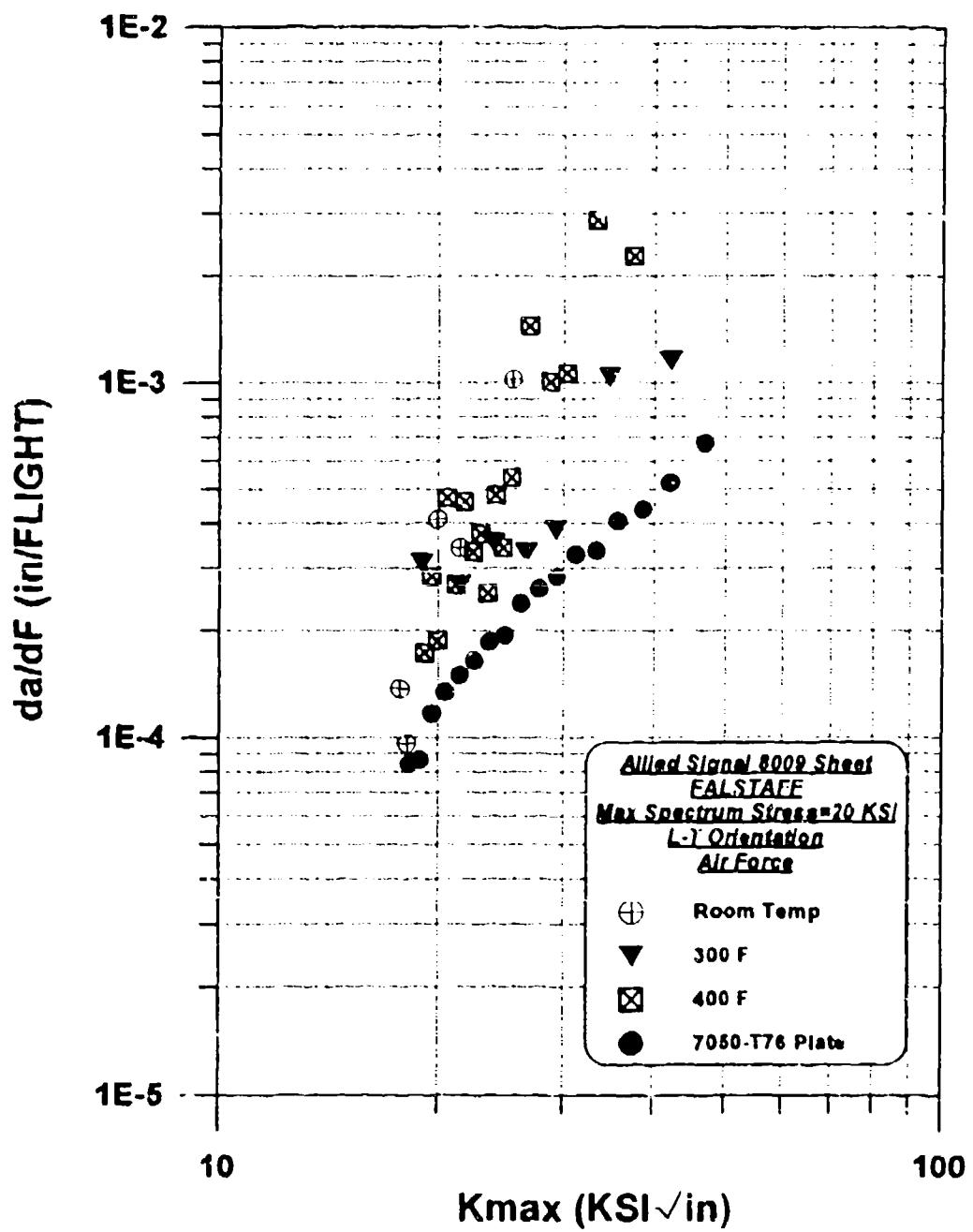


FIGURE A23. COMPARISON OF 8009 SHEET AND 7050-T76 PLATE FALSTAFF SPECTRUM FATIGUE CRACK GROWTH RATE DATA (L-T ORIENTATION). AIR FORCE.

SPECTRUM DATA REDUCTION

DATE:
 TITLE: Room Temp
 SPECIMEN NUMBER: SF2
 MATERIAL TYPE: 8009
 ORIENTATION: L-T
 SPECTRUM TYPE: FALSTAFF
 SPECIMEN THICKNESS= 0.09075 IN.
 SPECIMEN WIDTH= 4.0015 IN.
 P_{max}= 7266 LBS

<u>TOTAL FLIGHTS</u>	<u>CRACK LENGTH</u>	<u>da/dF</u>	<u>K MAX</u>
1	0.4542		
501	0.523	1.38E-04	17.69
1001	0.5711	9.62E-05	18.14
1501	0.7764	4.11E-04	19.96
2001	0.9471	3.41E-04	21.40
2501	1.4583	1.02E-03	25.42

TABLE A69. FALSTAFF SPECTRUM FATIGUE CRACK GROWTH RATE DATA FOR 8009 SHEET
(L-T ORIENTATION, ROOM TEMPERATURE) AIR FORCE.

SPECTRUM DATA REDUCTION

DATE: 300 F
 TITLE: SF4
 SPECIMEN NUMBER: 8009
 MATERIAL TYPE: L-T
 ORIENTATION: FALSTAFF
 SPECTRUM TYPE: 0.0955 IN.
 SPECIMEN THICKNESS= 3.9995 IN.
 SPECIMEN WIDTH= 7639 LBS
 Pmax=

<u>OTAL FLIGHTS</u>	<u>CRACK LENGTH</u>	<u>da/dF</u>	<u>K MAX</u>
1	0.4824		
501	0.6373	3.10E-04	18.99
1001	0.7719	2.69E-04	21.45
1501	0.9489	3.54E-04	23.94
2001	1.1143	3.31E-04	26.56
2501	1.3066	3.85E-04	29.25
3001	1.8259	1.04E-03	34.71
3301	2.1726	1.16E-03	42.14

TABLE A70. FALSTAFF SPECTRUM FATIGUE CRACK GROWTH RATE DATA FOR 8009 SHEET
 (L-T ORIENTATION, 300 F) AIR FORCE.

SPECTRUM DATA REDUCTION

DATE: 400 F
 TITLE: SF5
 SPECIMEN NUMBER: 8009
 MATERIAL TYPE: L-T
 ORIENTATION: FALSTAFF
 SPECTRUM TYPE: 0.093 IN.
 SPECIMEN THICKNESS= 3.997 IN.
 SPECIMEN WIDTH= 7434 LBS
 Pmax=

<u>TOTAL FLIGHTS</u>	<u>CRACK LENGTH</u>	<u>K MAX</u>	<u>da/dF</u>
0	0.5608		
100	0.5781	19.15	1.73E-04
200	0.6065	19.56	2.84E-04
300	0.6252	19.96	1.87E-04
400	0.6724	20.52	4.72E-04
500	0.6993	21.14	2.69E-04
600	0.7454	21.74	4.61E-04
700	0.7786	22.38	3.32E-04
800	0.8161	22.95	3.75E-04
900	0.8416	23.44	2.55E-04
1000	0.8897	24.02	4.81E-04
1100	0.9238	24.65	3.41E-04
1200	0.9777	25.33	5.39E-04
1300	1.1224	26.84	1.45E-03
1400	1.2229	28.68	1.01E-03
1500	1.3292	30.24	1.06E-03
1600	1.6153	33.24	2.86E-03
1700	1.8427	37.37	2.27E-03

TABLE A71. FALSTAFF SPECTRUM FATIGUE CRACK GROWTH RATE DATA FOR 8009 SHEET
(L-T ORIENTATION, 400 F) AIR FORCE.

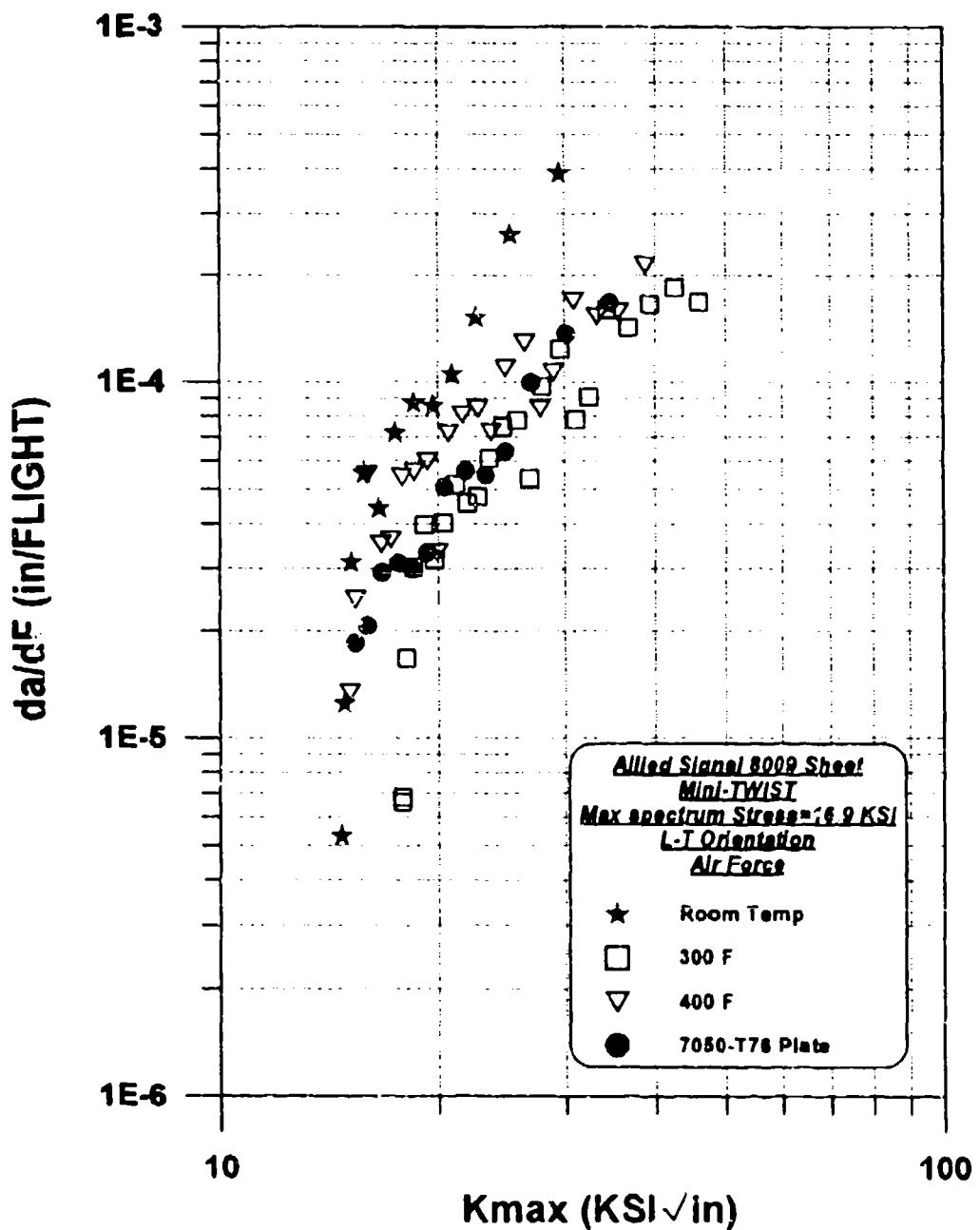


FIGURE A24. COMPARISON OF 8009 SHEET AND 7050-T76 PLATE MINI-TWIST SPECTRUM FATIGUE CRACK GROWTH RATE DATA (L-T ORIENTATION). AIR FORCE.

SPECTRUM DATA REDUCTION

DATE:
 TITLE: Room Temp
 SPECIMEN NUMBER: SF-8
 MATERIAL TYPE: 8009
 ORIENTATION: L-T
 SPECTRUM TYPE: MINITWIST
 SPECIMEN THICKNESS= 0.092 IN.
 SPECIMEN WIDTH= 4 IN.
 Pmax= 6219 LBS

OTAL FLIGHTS	CRACK LENGTH	da/dF	K MAX
1	0.4691		
1001	0.4744	5.30E-06	14.67
2001	0.4869	1.25E-05	14.82
3001	0.5181	3.12E-05	15.16
4001	0.5734	5.53E-05	15.83
5001	0.6176	4.42E-05	16.57
6001	0.6893	7.17E-05	17.41
7001	0.7763	8.70E-05	18.52
8001	0.8619	8.56E-05	19.68
9001	0.9667	1.05E-04	20.93
10001	1.1187	1.52E-04	22.58
11001	1.3798	2.61E-04	25.21
12001	1.7683	3.89E-04	29.44

TABLE A72. MINI-TWIST SPECTRUM FATIGUE CRACK GROWTH RATE DATA FOR 8009 SHEET
(L-T ORIENTATION, ROOM TEMPERATURE) AIR FORCE.

SPECTRUM DATA REDUCTION

DATE: 300 F
 TITLE: SF6
 SPECIMEN NUMBER: 8009
 MATERIAL TYPE: L-T
 ORIENTATION: MINITWIST
 SPECTRUM TYPE: 0.0955 IN.
 SPECIMEN THICKNESS= 3.9995 IN.
 SPECIMEN WIDTH= 7639 LBS
 P_{max}=

OTAL FLIGHTS	CRACK LENGTH	da/dF	K MAX
1	0.4932		
501	0.4965	6.60E-06	17.80
1001	0.4999	6.80E-06	17.86
2001	0.5167	1.68E-05	18.05
3001	0.547	3.03E-05	18.48
4001	0.5869	3.99E-05	19.11
5001	0.6187	3.18E-05	19.74
6001	0.659	4.03E-05	20.36
7001	0.7105	5.15E-05	21.13
8001	0.7562	4.57E-05	21.92
9001	0.8038	4.76E-05	22.67
10001	0.8648	6.10E-05	23.53
11001	0.9394	7.46E-05	24.58
12001	1.0173	7.79E-05	25.75
13001	1.0707	5.34E-05	26.74
14001	1.1678	9.71E-05	27.88
15001	1.2914	1.24E-04	29.54
16001	1.3697	7.83E-05	31.06
17001	1.4606	9.09E-05	32.35
18001	1.6207	1.60E-04	34.31
19001	1.7631	1.42E-04	36.75
20001	1.929	1.66E-04	39.37
21001	2.1141	1.85E-04	42.57
22001	2.2824	1.68E-04	46.10

TABLE A73. MINI-TWIST SPECTRUM. FATIGUE CRACK GROWTH RATE DATA FOR 8009 SHEET
(L-T ORIENTATION, 300 F) AIR FORCE.

SPECTRUM DATA REDUCTION

DATE: 400 F
 TITLE: SF9
 SPECIMEN NUMBER: 8009
 MATERIAL TYPE: L-T
 ORIENTATION: MINITWIST
 SPECTRUM TYPE: 0.092 IN.
 SPECIMEN THICKNESS= 4.0005 IN.
 SPECIMEN WIDTH= 6220 LBS
 Pmax=

<u>TOTAL FLIGHTS</u>	<u>CRACK LENGTH</u>	<u>da/dF</u>	<u>K MAX</u>
0	0.4905		
1000	0.5039	1.34E-05	15.08
2000	0.5285	2.46E-05	15.38
3000	0.5533	5.48E-05	15.98
4000	0.5818	3.51E-05	16.65
5000	0.6184	3.60E-05	17.17
6000	0.6544	5.39E-05	17.80
7000	0.7083	5.58E-05	18.56
8000	0.7641	5.96E-05	19.34
9000	0.8237	3.32E-05	19.96
10000	0.8569	7.16E-05	20.65
11000	0.9285	8.08E-05	21.64
12000	1.0093	8.37E-05	22.69
13000	1.093	7.21E-05	23.68
14000	1.1651	1.09E-04	24.83
15000	1.2743	1.29E-04	26.35
16000	1.4031	8.37E-05	27.73
17000	1.4868	1.06E-04	28.98
18000	1.5931	1.70E-04	30.86
19000	1.7633	1.53E-04	33.17
20000	1.9167	1.58E-04	35.55
21000	2.0749	2.14E-04	38.66
	2.2889		

TABLE A74. MINI-TWIST SPECTRUM FATIGUE CRACK GROWTH RATE DATA FOR 8009 SHEET
(L-T ORIENTATION, 400 F) AIR FORCE.

APPENDIX B

8009 EXTRUSION
1" X 4" X 48 "

TABLE 81
 TENSILE RESULTS AT $t/2$ LOCATION FOR
 ALLIED SIGNAL FVS0812 (8009) EXTRUSION (1" X 4")

COMPANY	TEST TEMP (DEGREES F)	ORIENT- ATION	ULTIMATE STRENGTH (KSI)	YIELD STRENGTH (KSI)	ELONG (%)	RA (%)	E (MSI)		
GENERAL DYNAMICS	RT	LONG	66.5	56.9	15.7		11.2		
			66.9	58.0	16.4		11.1		
			66.9	57.2	15.0		11.3		
MCDONNELL DOUGLAS	RT	LONG	63.9	56.6	13.8	48.9	8.6		
			63.7	56.5	15.2	57.5	9.1		
			62.5	54.9	13.6	56.2	9.4		
MCDONNELL DOUGLAS, CA	RT	LONG	63.0	53.2	12.0	49.0	11.8		
			63.5	54.3	13.0	50.0	11.8		
			63.0	53.7	13.0	57.0	11.7		
AIR FORCE	RT	LONG	74.1	64.7	13.5	49.9			
			73.8	63.4	13.3	48.6			
			73.8	63.2	14.3	54.0			
NASA-LANGLEY	RT	LONG	65.5	57.4	13.0				
			64.9	56.9	12.5				
			65.3						
NORTHROP	RT	LONG	65.3	54.5	14.3	53.9	13.0		
			66.0	56.4	13.8	51.7	13.9		
			65.0	54.9	14.4	53.7	12.7		
			AVERAGE	66.3	57.2	13.9	52.5		
			STANDARD DEVIATION	3.7	3.4	1.2	3.3		
							1.6		

TABLE B2

TENSILE RESULTS AT $t/2$ LOCATION FOR
ALLIED SIGNAL FVS0812 (8009) EXTRUSION (1" X 4")

COMPANY	TEST TEMP (DEGREES F)	ORIENT-ATION	ULTIMATE STRENGTH (KSI)	YIELD STRENGTH (KSI)	ELONG (%)	RA (%)	E (MSI)		
GENERAL DYNAMICS	RT	L TRANS	66.6	55.4	12.1		11.4		
			66.3	54.7	11.4		11.6		
			66.0	55.2	12.1		11.5		
MCDONNELL DOUGLAS	RT	L TRANS	64.9	56.4	12.1	40.0	8.4		
			64.7	56.0	12.5	41.2	8.5		
			65.5	57.0	10.8	36.2	8.1		
MCDONNELL DOUGLAS, CA	RT	L TRANS	64.0	52.6	8.0	33.0	11.8		
			63.9	51.6	9.0	28.0	11.9		
			64.6	52.6	10.0	35.0	12.0		
AIR FORCE	RT	L TRANS	74.6	61.3	11.9	29.3			
			75.1	62.5	9.1	28.0			
			74.4	61.6	9.2	27.9			
NASA-LANGLEY	RT	L TRANS	65.9	56.4	9.5				
			65.8	56.0	8.0				
			65.9	56.1					
NORTHROP	RT	L TRANS	67.3	56.3	9.5	30.6	12.5		
			66.7	54.7	8.7	27.6	13.1		
			66.6	54.6	8.9	27.1	13.3		
			AVERAGE	67.1	56.2	10.2	32.0		
			STANDARD DEVIATION	3.6	3.0	1.6	5.0		
							1.8		

TABLE B3

TENSILE RESULTS AT $t/2$ LOCATION FOR
ALLIED SIGNAL FVS0812 (8009) EXTRUSION (1" X 4")

COMPANY	TEST TEMP (DEGREES F)	ORIENT- ATION	ULTIMATE STRENGTH (KSI)	YIELD STRENGTH (KSI)	ELONG (%)	RA (%)	E (MSI)
NASA-LANGLEY	300	LONG	55.5	47.6	10.0		
			56.5	49.7	8.0		
			56.1	49.6	9.0		
		AVERAGE	56.0	49.0	9.0		
		STANDARD DEVIATION	0.5	1.2	1.0		

TABLE B4

TENSILE RESULTS AT $t/2$ LOCATION FOR
ALLIED SIGNAL FVS0812 (8009) EXTRUSION (1" X 4")

COMPANY	TEST TEMP (DEGREES F)	ORIENT- ATION	ULTIMATE STRENGTH (KSI)	YIELD STRENGTH (KSI)	ELONG (%)	RA (%)	E (MSI)
NASA-LANGLEY	300	L TRANS	56.4	47.6	4.0		
			57.2		5.0		
			56.8	48.4	5.5		
		AVERAGE	56.8	48.0	4.8		
		STANDARD DEVIATION	0.4	0.6	0.8		

TABLE B5

TENSILE RESULTS AT $t/2$ LOCATION FOR
ALLIED SIGNAL FVS0812 (8009) EXTRUSION (1" X 4")

COMPANY	TEST TEMP (DEGREES F)	ORIENT- ATION	ULTIMATE STRENGTH (KSI)	YIELD STRENGTH (KSI)	ELONG (%)	RA (%)	E (MSI)
GENERAL DYNAMICS	450	LONG	45.3	41.8	10.7		
			46.0	41.5	11.5		
			46.6	41.6	11.4		
MCDONNELL DOUGLAS	450	LONG	43.4	40.0	9.1	37.8	
			43.6	39.2	9.2	37.8	
			44.0	39.1	8.7	35.9	
MCDONNELL DOUGLAS, CA	450	LONG	43.8	40.8	11.0	37.0	11.1
			44.7	40.4	10.0	25.0	9.1
			45.0	42.4	11.0	44.0	
AIR FORCE	450	LONG	45.6	45.0	6.6	13.1	
			45.0	41.9	9.4	29.0	
NASA-LANGLEY	450	LONG	48.2	43.4	20.0		
			47.5	41.9	18.0		
ARMY	450	LONG	42.8	41.5	13.8	34.0	
			44.2		8.0	16.0	
			44.5		11.7	40.0	
		AVERAGE	45.0	41.5	11.3	31.8	10.1
		STANDARD DEVIATION	1.5	1.6	3.5	10.0	1.4

TABLE B6
TENSILE RESULTS AT $t/2$ LOCATION FOR
ALLIED SIGNAL FVS0812 (8009) EXTRUSION (1" X 4")

COMPANY	TEST TEMP (DEGREES F)	ORIENT- ATION	ULTIMATE STRENGTH (KSI)	YIELD STRENGTH (KSI)	ELONG (%)	RA (%)	E (MSI)
GENERAL DYNAMICS	450	L TRANS	44.6	40.9	7.2		
			45.3	42.0	7.2		
			45.0	41.6	8.9		
MCDONNELL DOUGLAS	450	L TRANS	44.1	39.2	6.1	18.9	
			44.7	37.9	6.6	22.5	
			43.3	38.7	6.9	14.6	
MCDONNELL DOUGLAS, CA	450	L TRANS	44.4	39.5	5.0	15.0	10.1
			43.5	38.7	6.0	15.0	10.4
			44.8	38.6	6.0	16.0	10.3
AIR FORCE	450	L TRANS	47.7	43.1	4.8	11.6	
NASA-LANGLEY	450	L TRANS	47.9	41.4	6.0		
			48.3	41.9	7.0		
			49.4	40.5	5.0		
ARMY	450	L TRANS	45.2	40.2	5.3	11.6	
			46.4	41.5	3.1	12.9	
			46.5	42.3	5.0	14.0	
		AVERAGE	45.7	40.5	6.0	15.2	10.3
		STANDARD DEVIATION	1.8	1.6	1.3	3.4	0.2

TABLE B7
TENSILE RESULTS AT $t/2$ LOCATION FOR
ALLIED SIGNAL FVS0812 (8009) EXTRUSION (1" X 4")

COMPANY	TEST TEMP (DEGREES F)	ORIENT- ATION	ULTIMATE STRENGTH (KSI)	YIELD STRENGTH (KSI)	ELONG (%)	RA (%)	E (MSI)
GENERAL DYNAMICS	600	LONG	34.7	33.4	14.6		
			34.1	32.9	13.9		
			34.3	32.5	14.2		
MCDONNELL DOUGLAS	600	LONG	32.9	28.7	12.3	44.3	
			33.8	29.6	12.9	47.4	
			32.2	28.0	12.6	46.6	
ARMY	600	LONG	27.1	25.9	19.8	46.0	7.4
			29.9	27.8	14.3	22.0	7.7
			33.6		5.6	18.0	9.1
		AVERAGE	32.5	29.9	13.4	37.4	8.1
		STANDARD DEVIATION	2.5	2.8	3.7	13.6	0.9

TABLE B8
TENSILE RESULTS AT $t/2$ LOCATION FOR
ALLIED SIGNAL FVS0812 (8009) EXTRUSION (1" X 4")

COMPANY	TEST TEMP (DEGREES F)	ORIENT- ATION	ULTIMATE STRENGTH (KSI)	YIELD STRENGTH (KSI)	ELONG (%)	RA (%)	E (MSI)
GENERAL DYNAMICS	600	L TRANS	34.7	31.7	9.3		
			36.7	34.0	10.0		
			33.6	31.7	10.0		
MCDONNELL DOUGLAS	600	L TRANS	33.0	27.2	8.5	23.2	
			33.1	27.8	10.5	26.6	
AIR FORCE	600	L TRANS	34.9	33.6	6.4	10.8	
			36.1	34.8	5.7	14.5	
ARMY	600	L TRANS	31.2	30.5	6.2	22.0	8.8
			31.2	31.1	4.6	15.6	9.8
			31.0	30.3	3.5	18.0	8.4
		AVERAGE	33.6	31.3	7.5	18.7	9.0
		STANDARD DEVIATION	2.0	2.3	2.5	5.5	0.7

TABLE B9

TENSILE RESULTS AT $t/2$ LOCATION FOR
 ALLIED SIGNAL FVS0812 (8009) EXTRUSION (1" X 4")
 (100 HR EXPOSURE @ 450F)

COMPANY	TEST TEMP (DEGREES F)	ORIENT- ATION	ULTIMATE STRENGTH (KSI)	YIELD STRENGTH (KSI)	ELONG (%)	RA (%)	E (MSI)
NORTHROP	450	LONG	44.1	40.5	8.8	34.1	10.9
			44.1	40.7	9.0	30.7	11.3
			44.2	40.4	9.5	30.6	11.1
		AVERAGE	44.1	40.5	9.1	31.8	11.1
		STANDARD DEVIATION	0.1	0.2	0.4	2.0	0.2

TABLE B10

TENSILE RESULTS AT $t/2$ LOCATION FOR
 ALLIED SIGNAL FVS0812 (8009) EXTRUSION (1" X 4")
 (100 HR EXPOSURE @ 450F)

COMPANY	TEST TEMP (DEGREES F)	ORIENT- ATION	ULTIMATE STRENGTH (KSI)	YIELD STRENGTH (KSI)	ELONG (%)	RA (%)	E (MSI)
NORTHROP	450	L TRANS	44.3	40.2	5.0	13.9	10.7
			44.8	40.8	5.0	13.1	10.8
			44.7	40.8	4.5	12.8	11.0
		AVERAGE	44.6	40.6	4.8	13.3	10.8
		STANDARD DEVIATION	0.3	0.3	0.3	0.6	0.2

TABLE B11

TENSILE RESULTS AT $t/2$ LOCATION FOR
 ALLIED SIGNAL FVS0812 (8009) EXTRUSION (1" X 4")
 (100 HR EXPOSURE @ 600F)

COMPANY	TEST TEMP	ORIENT- ATION	ULTIMATE STRENGTH (KSI)	YIELD STRENGTH (KSI)	ELONG (%)	RA (%)	E (MSI)
	(DEGREES F)						
NORTHROP	600	LONG	34.2	33.1	10.4	32.0	10.2
			33.9	32.5			10.9
			34.3	32.7	11.0	31.3	10.6
		AVERAGE	34.1	32.8	10.7	31.7	10.6
		STANDARD DEVIATION	0.2	0.3	0.4	0.5	0.4

TABLE B12

TENSILE RESULTS AT $t/2$ LOCATION FOR
 ALLIED SIGNAL FVS0812 (8009) EXTRUSION (1" X 4")
 (100 HR EXPOSURE @ 600F)

COMPANY	TEST TEMP	ORIENT- ATION	ULTIMATE STRENGTH (KSI)	YIELD STRENGTH (KSI)	ELONG (%)	RA (%)	E (MSI)
	(DEGREES F)						
NORTHROP	600	L TRANS	33.7	32.1	6.1	11.9	10.1
			33.6	32.0	6.2	12.3	10.4
			33.9	32.2	6.3	14.1	10.2
		AVERAGE	33.7	32.1	6.2	12.8	10.2
		STANDARD DEVIATION	0.2	0.1	0.1	1.2	0.2

TABLE B13
 TENSILE RESULTS AT $t/2$ LOCATION FOR
 ALLIED SIGNAL FVS0812 (8009) EXTRUSION (1" X 4")

COMPANY	TEST TEMP (DEGREES F)	ORIENT- ATION	ULTIMATE STRENGTH (KSI)	YIELD STRENGTH (KSI)	ELONG (%)	RA (%)	E (MSI)
GENERAL DYNAMICS	-320	LONG	98.2	79.0	0.7		
			96.9	79.4			
			87.4	79.1			
		AVERAGE	94.2	79.2	0.7		
		STANDARD DEVIATION	5.9	0.2			

TABLE B14

COMPRESSION RESULTS AT $t/2$ LOCATION FOR
ALLIED SIGNAL FVS0812 (8009) EXTRUSION (1" X 4")

COMPANY	TEST TEMPERATURE (DEGREES F)	ORIENTATION	COMPRESSIVE YIELD STRENGTH (KSI)	COMPRESSIVE MODULUS (MSI)
MCDONNELL DOUGLAS	RT	LONG	69.2 71.3 68.6	
MCDONNELL DOUGLAS, CA	RT	LONG	52.1 51.7 51.7	12.5 13.1 12.4
NASA-LANGLEY	RT	LONG	57.2 57.2 55.8	12.8 12.9 13.2
NORTHROP	RT	LONG	54.8 54.8	13.0 13.0
		AVERAGE	58.6	12.9
		STANDARD DEVIATION	7.4	0.3

TABLE B15

COMPRESSION RESULTS AT $t/2$ LOCATION FOR
ALLIED SIGNAL FVS0812 (8009) EXTRUSION (1" X 4")

COMPANY	TEST TEMPERATURE (DEGREES F)	ORIENTATION	COMPRESSIVE YIELD STRENGTH (KSI)	COMPRESSIVE MODULUS (MSI)
MCDONNELL DOUGLAS	RT	L TRANS	69.9 69.0 68.6	
NASA-LANGLEY	RT	L TRANS	58.4 59.4 58.7	12.8 12.9 12.9
NORTHROP	RT	L TRANS	56.2 57.9	13.0 13.0
		AVERAGE	62.3	12.9
		STANDARD DEVIATION	5.8	0.1

TABLE B16

COMPRESSION RESULTS AT $t/2$ LOCATION FOR
ALLIED SIGNAL FVS0812 (8009) EXTRUSION (1" X 4")

COMPANY	TEST TEMPERATURE (DEGREES F)	ORIENTATION	COMPRESSIVE YIELD STRENGTH (KSI)	COMPRESSIVE MODULUS (MSI)
MCDONNELL DOUGLAS	450	LONG	53.8	
			53.6	
			53.8	
MCDONNELL DOUGLAS, CA	450	LONG	37.2	10.4
			38.1	10.6
NASA-LANGLEY	450	LONG	39.1	11.3
			39.2	11.1
			38.8	11.3
		AVERAGE	44.2	10.9
		STANDARD DEVIATION	7.9	0.4

TABLE B17

COMPRESSION RESULTS AT $t/2$ LOCATION FOR
ALLIED SIGNAL FVS0812 (8009) EXTRUSION (1" X 4")

COMPANY	TEST TEMPERATURE (DEGREES F)	ORIENTATION	COMPRESSIVE YIELD STRENGTH (KSI)	COMPRESSIVE MODULUS (MSI)
MCDONNELL DOUGLAS	450	L TRANS	55.2	
			56.0	
			57.0	
NASA-LANGLEY	450	L TRANS	41.6	11.1
			41.6	11.1
			41.5	11.1
		AVERAGE	43.3	11.1
		STANDARD DEVIATION	8.0	0.0

TABLE B18

COMPRESSION RESULTS AT $t/2$ LOCATION FOR
ALLIED SIGNAL FVS0812 (8009) EXTRUSION (1" X 4")

COMPANY	TEST TEMPERATURE (DEGREES F)	ORIENTATION	COMPRESSIVE YIELD STRENGTH (KSI)	COMPRESSIVE MODULUS (MSI)
MCDONNELL DOUGLAS	600	LONG	43.6	
			43.6	
			45.2	
		AVERAGE	44.2	
		STANDARD DEVIATION	0.9	

TABLE B19

COMPRESSION RESULTS AT $t/2$ LOCATION FOR
ALLIED SIGNAL FVS0812 (8009) EXTRUSION (1" X 4")

COMPANY	TEST TEMPERATURE (DEGREES F)	ORIENTATION	COMPRESSIVE YIELD STRENGTH (KSI)	COMPRESSIVE MODULUS (MSI)
MCDONNELL DOUGLAS	600	L TRANS	48.2	
			48.2	
		AVERAGE	48.2	
		STANDARD DEVIATION	0.0	

TABLE B20

COMPRESSION RESULTS AT $t/2$ LOCATION FOR
ALLIED SIGNAL FVS0812 (8009) EXTRUSION (1" X 4")

COMPANY	TEST TEMPERATURE (DEGREES F)	ORIENTATION	COMPRESSIVE YIELD STRENGTH (KSI)	COMPRESSIVE MODULUS (MSI)
NASA-LANGLEY	300	LONG	46.3	11.6
			45.6	12.8
			45.8	12.1
		AVERAGE	45.9	12.2
		STANDARD DEVIATION	0.4	0.6

TABLE B21

COMPRESSION RESULTS AT $t/2$ LOCATION FOR
ALLIED SIGNAL FVS0812 (8009) EXTRUSION (1" X 4")

COMPANY	TEST TEMPERATURE (DEGREES F)	ORIENTATION	COMPRESSIVE YIELD STRENGTH (KSI)	COMPRESSIVE MODULUS (MSI)
NASA-LANGLEY	300	L TRANS	48.2	12.5
			51.2	9.8
			49.8	11.8
		AVERAGE	49.7	11.4
		STANDARD DEVIATION	1.5	1.4

TABLE B22
BEARING RESULTS AT $t/2$ LOCATION FOR
ALLIED SIGNAL FVS0812 (8009) EXTRUSION (1" X 4")

COMPANY	TEST TEMPERATURE (DEGREES F)	ORIENTATION	e/D	BEARING ULT. STR. (KSI)	BEARING YIELD STR. (KSI)
MCDONNELL DOUGLAS	RT	LONG	1.5	123.2 126.7 122.0	110.7 113.8 111.7
MCDONNELL DOUGLAS, CA	RT	LONG	1.5	94.0 87.6 95.4	84.0 83.1 84.7
NASA-LANGLEY	RT	LONG	1.5	103.2 101.2	93.4 91.1
			AVERAGE	106.6	96.6
			STANDARD DEVIATION	15.1	13.3

TABLE B23
BEARING RESULTS AT $t/2$ LOCATION FOR
ALLIED SIGNAL FVS0812 (8009) EXTRUSION (1" X 4")

COMPANY	TEST TEMPERATURE (DEGREES F)	ORIENTATION	e/D	BEARING ULT. STR. (KSI)	BEARING YIELD STR. (KSI)
MCDONNELL DOUGLAS	RT	L TRANS	1.5	121.3 122.2	113.3 114.3
			AVERAGE	121.7	113.8
			STANDARD DEVIATION	0.6	0.7

TABLE B24

BEARING RESULTS AT $t/2$ LOCATION FOR
 ALLIED SIGNAL FVS0812 (8009) EXTRUSION (1" X 4")

COMPANY	TEST TEMPERATURE (DEGREES F)	ORIENTATION	e/D	BEARING ULT. STR. (KSI)	BEARING YIELD STR. (KSI)
MCDONNELL DOUGLAS	450	LONG	1.5	85.4 91.6 91.3	82.1 89.0 87.8
			AVERAGE	89.5	86.3
			STANDARD DEVIATION	3.5	3.7

TABLE B25

BEARING RESULTS AT $t/2$ LOCATION FOR
 ALLIED SIGNAL FVS0812 (8009) EXTRUSION (1" X 4")

COMPANY	TEST TEMPERATURE (DEGREES F)	ORIENTATION	e/D	BEARING ULT. STR. (KSI)	BEARING YIELD STR. (KSI)
MCDONNELL DOUGLAS	450	L TRANS	1.5	86.0 91.9 81.7	81.6 82.7 80.6
			AVERAGE	86.5	81.6
			STANDARD DEVIATION	5.1	1.0

TABLE B26

BEARING RESULTS AT $t/2$ LOCATION FOR
ALLIED SIGNAL FVS0812 (8009) EXTRUSION (1" X 4")

COMPANY	TEST TEMPERATURE (DEGREES F)	ORIENTATION	e/D	BEARING ULT. STR. (KSI)	BEARING YIELD STR. (KSI)
MCDONNELL DOUGLAS	600	LONG	1.5	78.5 78.2 76.1	72.4 72.4 69.4
		AVERAGE		77.6	71.4
		STANDARD DEVIATION		1.3	1.8

TABLE B27

BEARING RESULTS AT $t/2$ LOCATION FOR
ALLIED SIGNAL FVS0812 (8009) EXTRUSION (1" X 4")

COMPANY	TEST TEMPERATURE (DEGREES F)	ORIENTATION	e/D	BEARING ULT. STR. (KSI)	BEARING YIELD STR. (KSI)
MCDONNELL DOUGLAS	600	L TRANS	1.5	78.2 72.2 75.5	67.3 65.3 66.8
		AVERAGE		75.3	66.5
		STANDARD DEVIATION		3.0	1.1

TABLE B28

BEARING RESULTS AT $t/2$ LOCATION FOR
ALLIED SIGNAL FVS0812 (8009) EXTRUSION (1" X 4")

COMPANY	TEST TEMPERATURE (DEGREES F)	ORIENTATION	e/D	BEARING ULT. STR. (KSI)	BEARING YIELD STR. (KSI)
MCDONNELL DOUGLAS	RT	LONG	2.0	157.2	148.0
				160.6	138.8
				159.3	138.8
MCDONNELL DOUGLAS, CA	RT	LONG	2.0	118.8	95.5
				121.8	95.9
				120.0	97.3
NASA-LANGLEY	RT	LONG	2.0	124.7	99.5
				125.8	107.7
				AVERAGE	115.2
				STANDARD DEVIATION	22.6

TABLE B29

BEARING RESULTS AT $t/2$ LOCATION FOR
ALLIED SIGNAL FVS0812 (8009) EXTRUSION (1" X 4")

COMPANY	TEST TEMPERATURE (DEGREES F)	ORIENTATION	e/D	BEARING ULT. STR. (KSI)	BEARING YIELD STR. (KSI)
MCDONNELL DOUGLAS	RT	L TRANS	2.0	157.9	135.7
				154.7	134.7
				AVERAGE	135.2
				STANDARD DEVIATION	0.7

TABLE B30

BEARING RESULTS AT t/2 LOCATION FOR
ALLIED SIGNAL FVS0812 (8009) EXTRUSION (1" X 4")

COMPANY	TEST TEMPERATURE (DEGREES F)	ORIENTATION	e/D	BEARING ULT. STR. (KSI)	BEARING YIELD STR. (KSI)
MCDONNELL DOUGLAS	450	LONG	2.0	116.1 113.6 122.7	107.1 101.0 105.1
			AVERAGE	117.5	104.4
			STANDARD DEVIATION	4.7	3.1

TABLE B31

BEARING RESULTS AT t/2 LOCATION FOR
ALLIED SIGNAL FVS0812 (8009) EXTRUSION (1" X 4")

COMPANY	TEST TEMPERATURE (DEGREES F)	ORIENTATION	e/D	BEARING ULT. STR. (KSI)	BEARING YIELD STR. (KSI)
MCDONNELL DOUGLAS	450	L TRANS	2.0	116.2 108.1	106.1 95.9
			AVERAGE	112.2	101.0
			STANDARD DEVIATION	5.8	7.2

TABLE B32

BEARING RESULTS AT $t/2$ LOCATION FOR
ALLIED SIGNAL FVS0812 (8009) EXTRUSION (1" X 4")

COMPANY	TEST TEMPERATURE (DEGREES F)	ORIENTATION	e/D	BEARING ULT. STR. (KSI)	BEARING YIELD STR. (KSI)
MCDONNELL DOUGLAS	600	LONG	2.0	97.9 96.8 98.0	85.7 85.7 84.7
			AVERAGE	97.6	85.4
			STANDARD DEVIATION	0.7	0.6

TABLE B33

BEARING RESULTS AT $t/2$ LOCATION FOR
ALLIED SIGNAL FVS0812 (8009) EXTRUSION (1" X 4")

COMPANY	TEST TEMPERATURE (DEGREES F)	ORIENTATION	e/D	BEARING ULT. STR. (KSI)	BEARING YIELD STR. (KSI)
MCDONNELL DOUGLAS	600	L TRANS	2.0	99.0 96.8	88.8 96.2
			AVERAGE	97.9	92.5
			STANDARD DEVIATION	1.5	5.3

TABLE B34
FRACTURE TOUGHNESS RESULTS FOR
ALLIED SIGNAL FVS0812 (8009) EXTRUSION (1" X 4")

COMPANY	TEST TEMPERATURE (DEGREES F)	ORIENTATION	KIC (KSI in ^{-0.5})	Kq (KSI in ^{-0.5})	COMMENT
MCDONNELL DOUGLAS	RT	L-T		22.3	(1)
MCDONNELL DOUGLAS, CA	RT	L-T		32.2	(2)
				22.8	(2)
NORTHROP	RT	L-T		28.5	(2)
ARMY	RT	L-T	12.3		VALID
				11.8	(2)
			15.6		VALID
			12.7		VALID
		AVERAGE	13.5	23.5	
		STANDARD DEVIATION	1.8	7.7	

(1): INVALID DUE TO VIOLATION OF ASTM E399 PRECRACK LENGTH REQUIREMENTS

(2): INVALID DUE TO $P_{max}/P_q > 1.1$

TABLE B35

FRACTURE TOUGHNESS RESULTS FOR
ALLIED SIGNAL FVS0812 (8009) EXTRUSION (1" X 4")

COMPANY	TEST TEMPERATURE (DEGREES F)	ORIENTATION	KIC (KSI in ^{0.5})	Kq KSI in ^{0.5})	COMMENT
MCDONNELL DOUGLAS	450	L-T	20.6	17.4	(1)
NORTHROP	450	L-T		15.5	(2), (3)
AVERAGE			20.6	16.5	
STANDARD DEVIATION				1.3	

(1): INVALID DUE TO VIOLATION OF ASTM E399 PRECRACK LENGTH REQ
 (2): INVALID DUE TO $P_{max}/P_q > 1.1$
 (3): 100 HR EXPOSURE @ 450F PRIOR TO TEST

TABLE B36

FRACTURE TOUGHNESS RESULTS FOR
ALLIED SIGNAL FVS0812 (8009) EXTRUSION (1" X 4")

COMPANY	TEST TEMPERATURE (DEGREES F)	ORIENTATION	KIC (KSI in ^{0.5})	Kq KSI in ^{0.5})	COMMENT
MCDONNELL DOUGLAS	600	L-T	22.2	24.9	(1), (2) (2)
NORTHROP	600	L-T		15.3	(3), (4)
AVERAGE			20.8		
STANDARD DEVIATION				5.0	

(1): INVALID DUE TO VIOLATION OF ASTM E399 PRECRACK LENGTH REQ
 (2): INVALID DUE TO $a & B < 2.5(K_q/YS)^2$
 (3): INVALID DUE TO $P_{max}/P_q > 1.1$
 (4): 100 HR EXPOSURE @ 600F PRIOR TO TEST

TABLE B37

FRACTURE TOUGHNESS RESULTS FOR
ALLIED SIGNAL FVS0812 (8009) EXTRUSION (1" X 4")

COMPANY	TEST TEMPERATURE (DEGREES F)	ORIENTATION	KIC (KSI in ^{0.5})	Kq (KSI in ^{0.5})	COMMENT
MCDONNELL DOUGLAS, CA	RT	T-L	12.8 16.1		VALID VALID
NORTHROP	RT	T-L	13.8		VALID
		AVERAGE	14.2		
		STANDARD DEVIATION	1.7		

TABLE B38
FRACTURE TOUGHNESS RESULTS FOR
ALLIED SIGNAL FVS0812 (8009) EXTRUSION (1" X 4")

COMPANY	TEST TEMPERATURE (DEGREES F)	ORIENTATION	KIC (KSI in ^{0.5})	Kq (KSI in ^{0.5})	COMMENT
NORTHROP	450	T-L		12.0	(1), (2)
		AVERAGE		12.0	
		STANDARD DEVIATION			

(1): INVALID DUE TO P_{max}/P_q > 1.1
(2): 100 HR EXPOSURE @ 450F PRIOR TO TEST

TABLE B39
FRACTURE TOUGHNESS RESULTS FOR
ALLIED SIGNAL FVS0812 (8009) EXTRUSION (1" X 4")

COMPANY	TEST TEMPERATURE (DEGREES F)	ORIENTATION	KIC (KSI in ^{0.5})	Kq (KSI in ^{0.5})	COMMENT
NORTHROP	600	T-L		9.8	(1), (2)
		AVERAGE		9.8	
		STANDARD DEVIATION			

(1): INVALID DUE TO P_{max}/P_q > 1.1
(2): 100 HR EXPOSURE @ 600F PRIOR TO TEST

TABLE B40

PATIGUE RESULTS WITH R=0.1 AND K_t=1.0 FOR
ALLIED SIGNAL FVS0812 (8009) EXTRUSION (1" X 4")

COMPANY	TEST TEMPERATURE (DEGREES F)	ORIENTATION	STRESS (KSI)	CYCLES	
NORTHROP	RT	LONG	35.0	3,000,000	*
			42.0	3,000,000	*
			44.0	984,890	
			45.0	688,650	
			50.0	69,890	
ARMY	RT	LONG	39.0	14,710,000	*
			40.0	15,186,000	*
			40.5	15,446,000	*
			41.0	1,206,000	
			41.3	234,000	
			42.5	217,000	
			45.0	133,000	
			50.0	385,000	

(*) : RUN OUT

TABLE B41

FATIGUE RESULTS WITH R=0.1 AND Kt=1.0 FOR
 ALLIED SIGNAL FVS0812 (8009) EXTRUSION (1" X 4")

COMPANY	TEST TEMPERATURE (DEGREES F)	ORIENTATION	STRESS (KSI)	CYCLES
ARMY	450	LONG	32.0	1,071,000
			32.0	604,000
			34.0	6,800,000
			34.0	769,000
			35.0	2,809,000
			38.0	962,000
			41.0	18,000

(#): FAILED IN THREADS

TABLE B42

FATIGUE RESULTS WITH R=0.1 AND K_t=3.0 FOR
ALLIED SIGNAL FVS0812 (8009) EXTRUSION (1" X 4")

COMPANY	TEST TEMPERATURE (DEGREES F)	ORIENTATION	STRESS (KSI)	CYCLES	
NORTHROP	RT	LONG	17.0	3,000,000	*
			18.0	3,000,000	*
			19.0	2,332,730	
			20.0	266,810	
			25.0	63,200	

(*): RUN OUT

TABLE B43

FATIGUE RESULTS WITH R=0.1 AND Kt=1.0 FOR
 ALLIED SIGNAL PVS0812 (8009) EXTRUSION (1" X 4")
 (100 HR EXPOSURE @ 450F)

COMPANY	TEST TEMPERATURE (DEGREES F)	ORIENTATION	STRESS (KSI)	CYCLES	
NORTHROP	450	LONG	30.0	1,000,000	*
			33.0	372,251	
			35.0	275,057	
			40.0	84,878	
			45.0	36,260	

(*): RUN OUT

TABLE B44

FATIGUE RESULTS WITH R=0.1 AND Kt=3.0 FOR
 ALLIED SIGNAL FVS0812 (8009) EXTRUSION (1" X 4")
 (100 HR EXPOSURE @ 450F)

COMPANY	TEST TEMPERATURE (DEGREES F)	ORIENTATION	STRESS (KSI)	CYCLES	
NORTHROP	450	LONG	15.0	1,000,000	*
			16.0	1,000,000	*
			17.0	181,530	
			18.0	273,750	
			20.0	108,460	

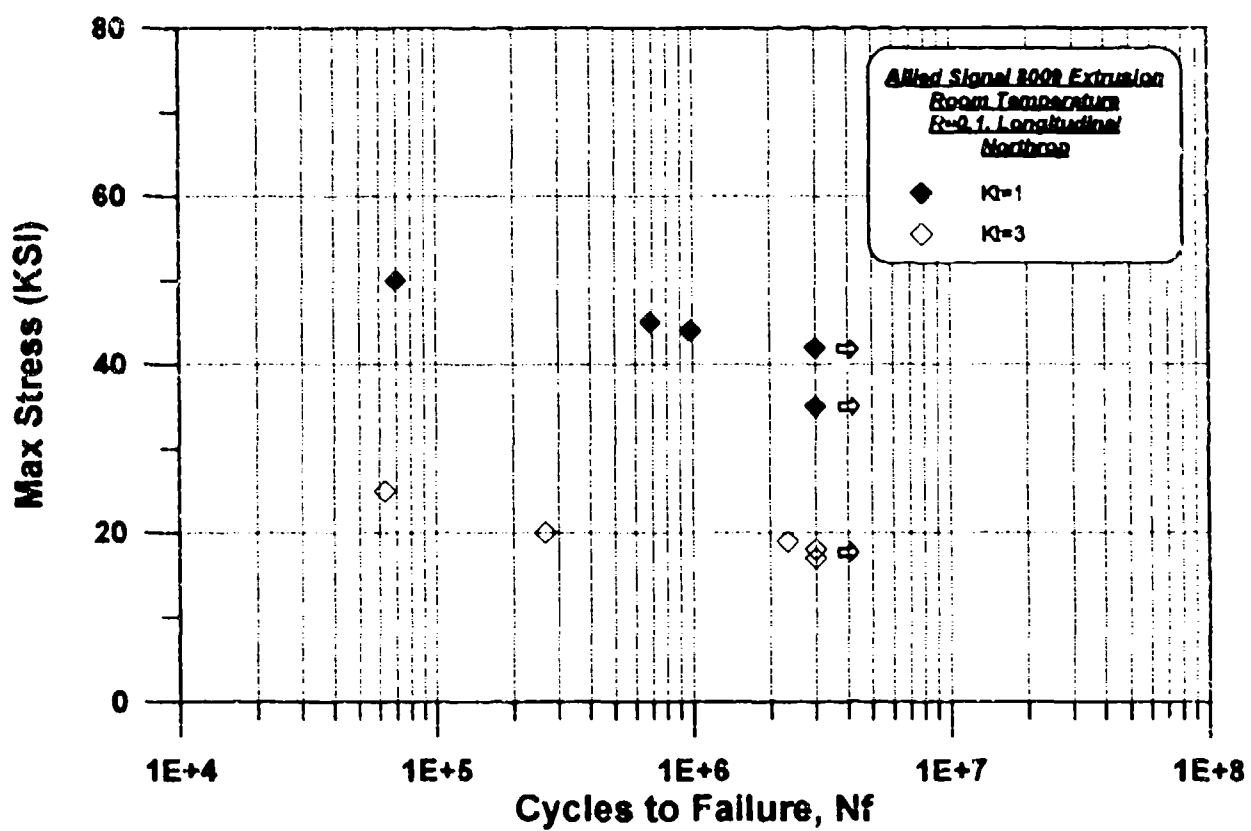
(*) : RUN OUT

TABLE B45

FATIGUE RESULTS WITH R=0.1 AND Kt=1.0 FOR
ALLIED SIGNAL FVS0812 (8009) EXTRUSION (1" X 4")

COMPANY	TEST TEMPERATURE (DEGREES F)	ORIENTATION	STRESS (KSI)	CYCLES
ARMY	600	LONG	27.0	5,652,000
			27.0	10,401,000
			29.0	4,875,000
			29.0	679,000
			31.0	2,481,000
			33.0	997,000
			35.0	1,580,000
			35.0	1,649,000

(#): FAILED IN THREADS



**FIGURE B1. FATIGUE RESULTS OF 8009 EXTRUSION
(LONGITUDINAL ORIENTATION) NORTROP.**

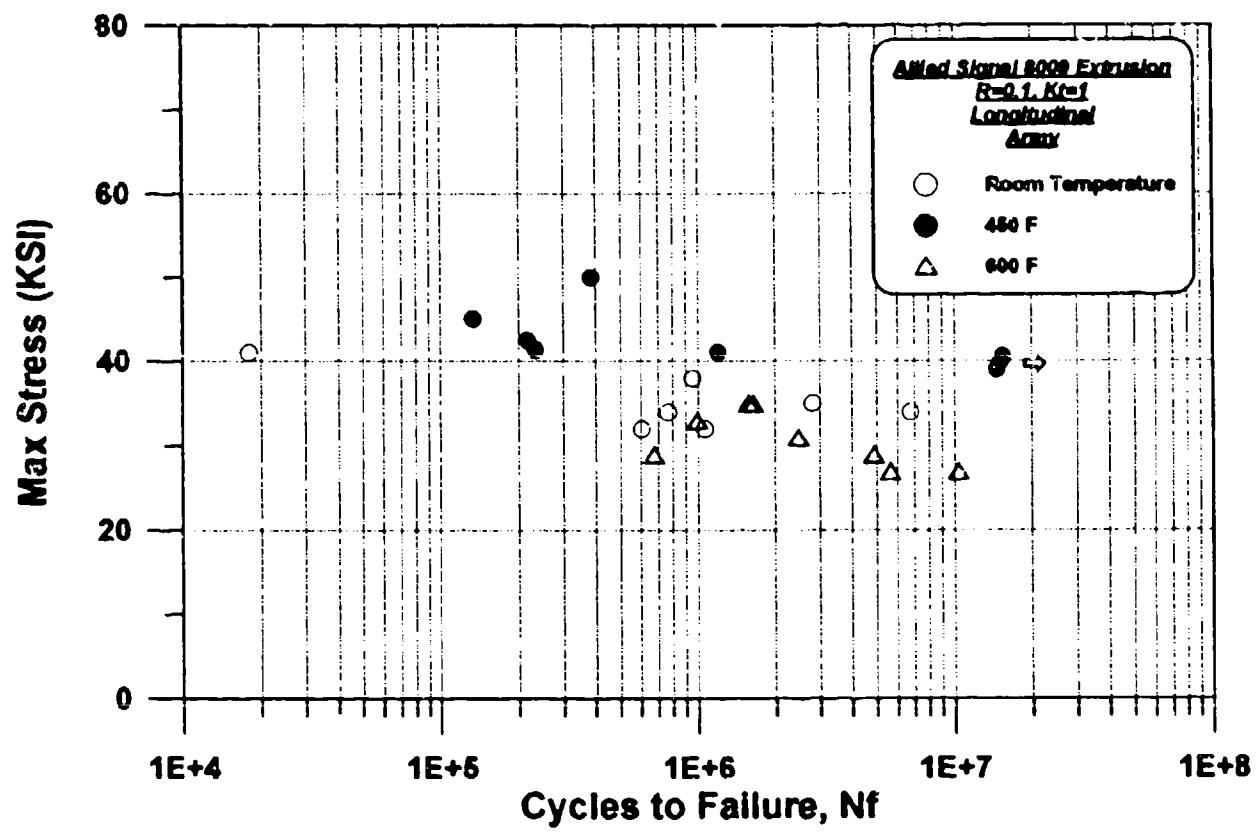
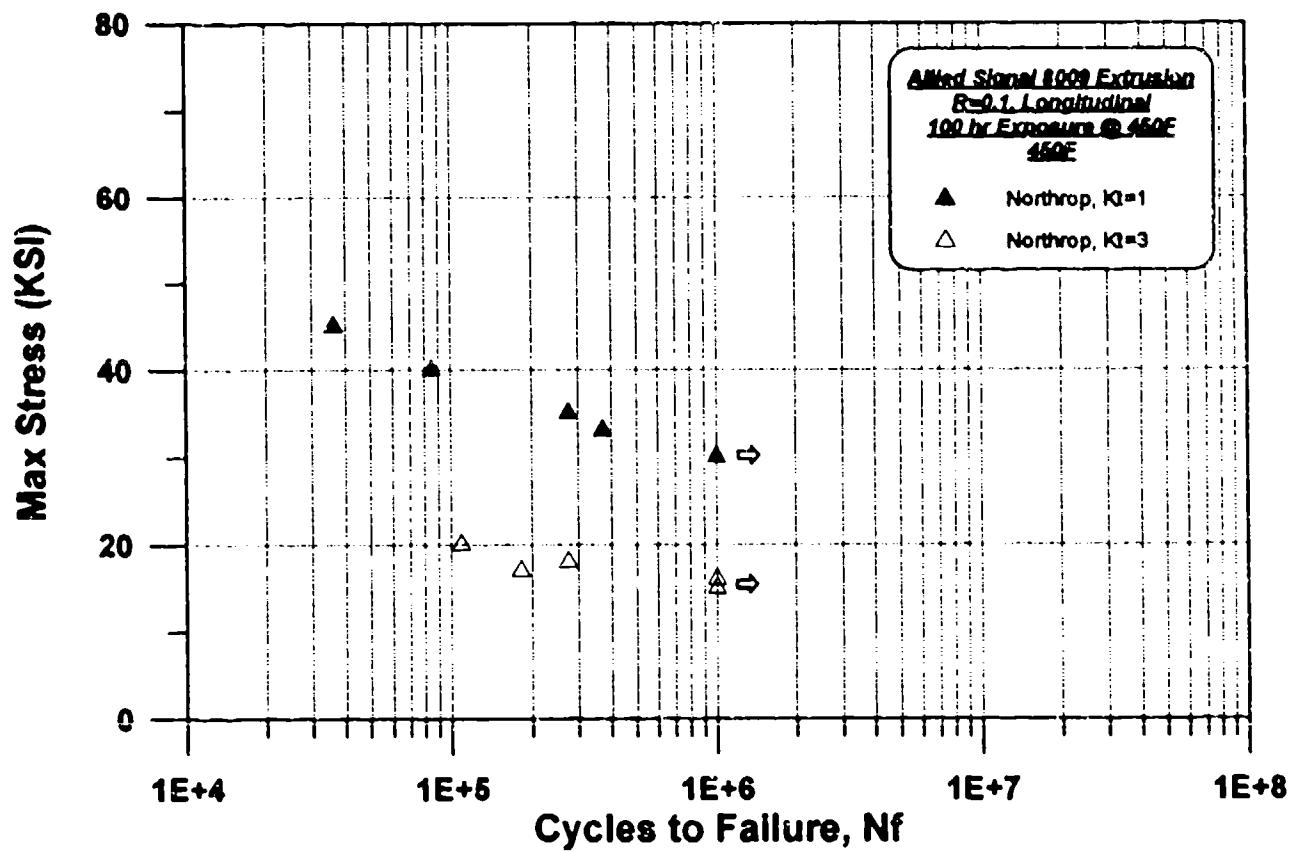


FIGURE B2. FATIGUE RESULTS OF 8009 EXTRUSION
(LONGITUDINAL ORIENTATION) ARMY.



**FIGURE B3. FATIGUE RESULTS OF 8009 EXTRUSION
(LONGITUDINAL ORIENTATION, 100 HR EXPOSURE)
NORTHROP.**

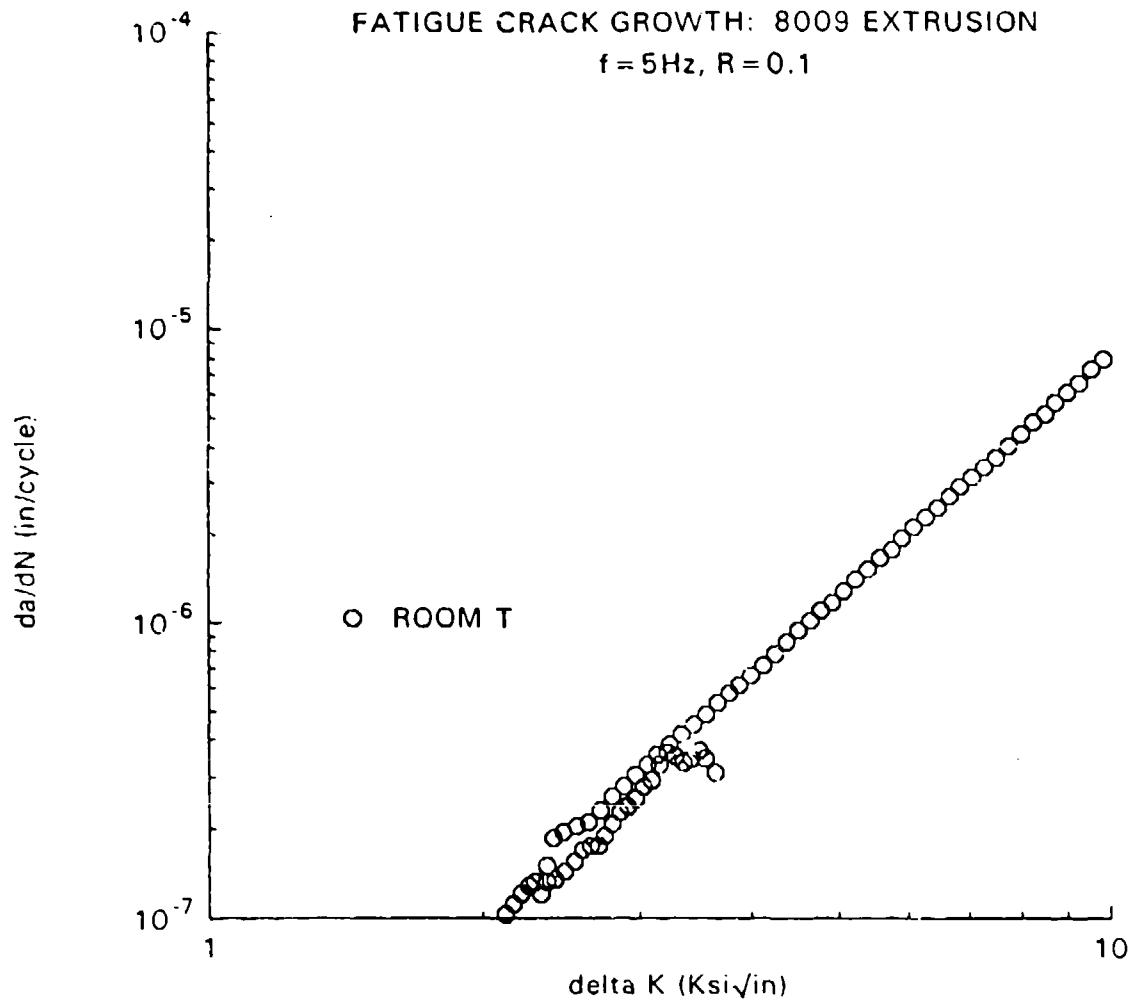


FIGURE B4. FATIGUE CRACK GROWTH RATE RESULTS FOR 8009 EXTRUSION (L-T ORIENTATION, ROOM TEMPERATURE) NASA-LANGLEY.

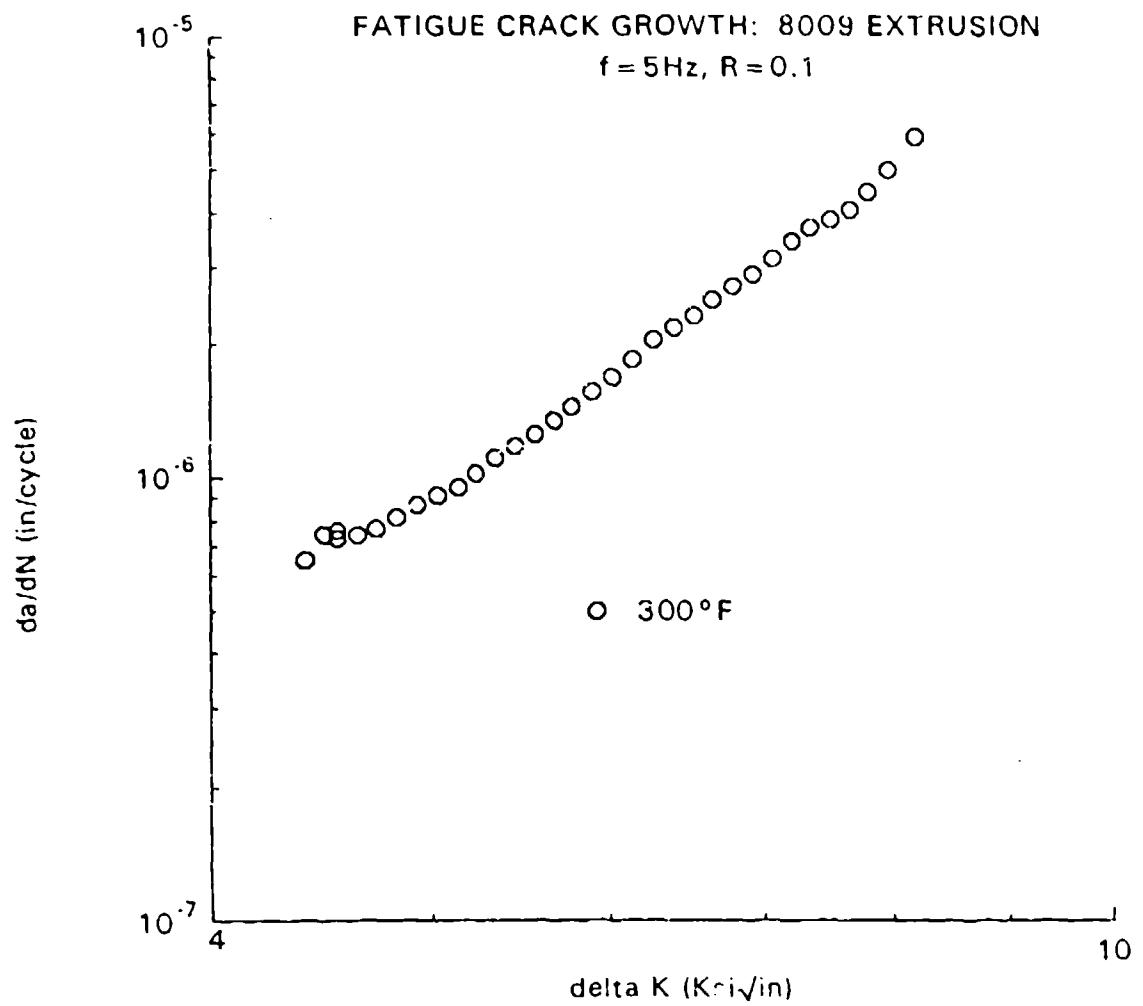


FIGURE 65. FATIGUE CRACK GROWTH RATE RESULTS FOR 8009 EXTRUSION
(L-T ORIENTATION, 300 F) NASA-LANGLEY.

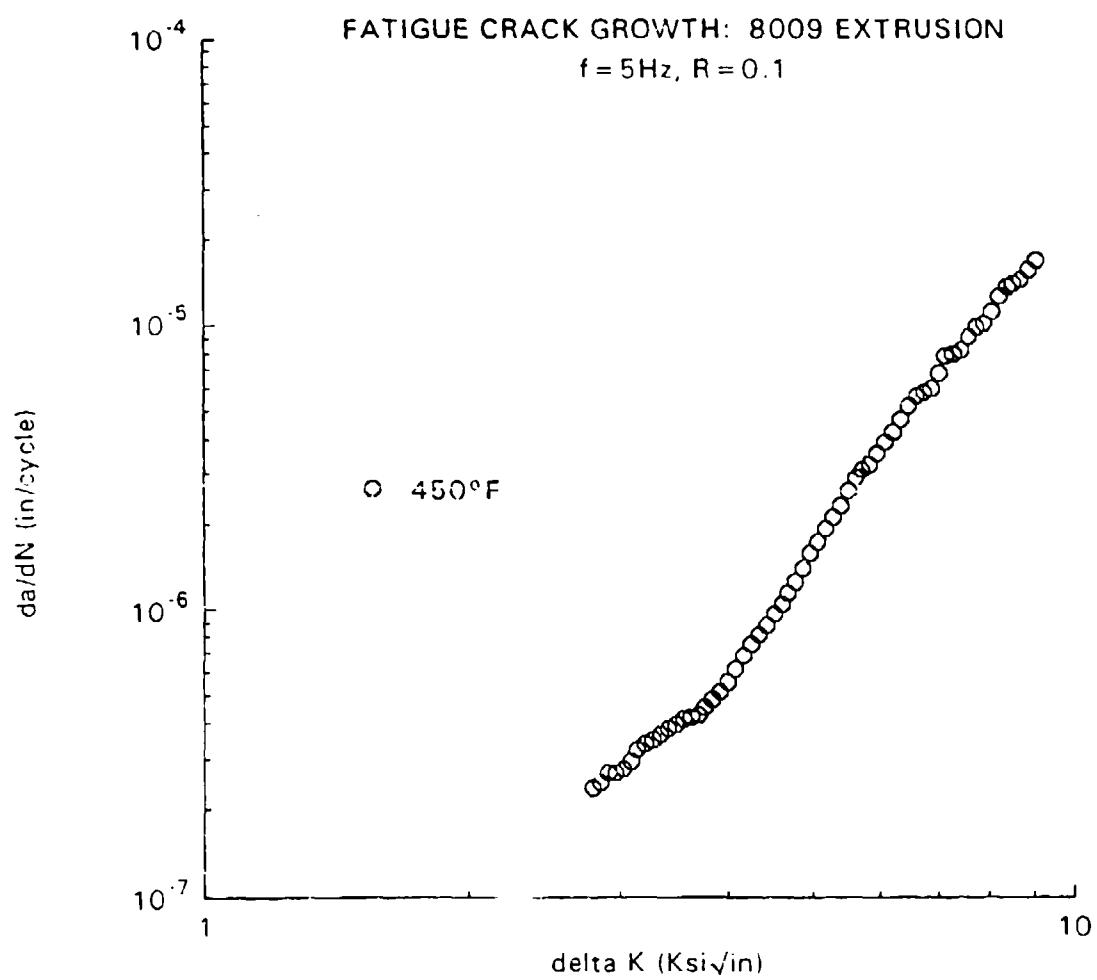


FIGURE B6. FATIGUE CRACK GROWTH RATE RESULTS FOR 8009 EXTRUSION
(L-T ORIENTATION, 450°F) NASA-LANGLEY.

450 F da/dN	450 F delta K	300 F da/dN	300 F delta K	room T da/dN	room T delta K
1.70E-05	9.10	5.89E-06	8.19	3.08E-07	3.64
1.57E-05	8.91	4.93E-06	7.97	3.43E-07	3.56
1.46E-05	8.73	4.40E-06	7.81	3.66E-07	3.49
1.41E-05	8.56	4.02E-06	7.66	3.46E-07	3.42
1.36E-05	8.39	3.84E-06	7.50	3.35E-07	3.35
1.26E-05	8.23	3.69E-06	7.36	3.51E-07	3.29
1.11E-05	8.07	3.41E-06	7.21	3.58E-07	3.22
1.02E-05	7.91	3.12E-06	7.07	3.27E-07	3.16
9.88E-06	7.75	2.89E-06	6.93	2.91E-07	3.09
9.10E-06	7.60	2.71E-06	6.79	2.78E-07	3.03
8.21E-06	7.45	2.52E-06	6.66	2.54E-07	2.97
7.91E-06	7.30	2.31E-06	6.52	2.36E-07	2.91
7.85E-06	7.15	2.17E-06	6.39	2.26E-07	2.85
6.86E-06	7.01	2.05E-06	6.27	2.07E-07	2.80
6.11E-06	6.87	1.84E-06	6.14	1.89E-07	2.74
5.83E-06	6.74	1.70E-06	6.02	1.74E-07	2.69
5.63E-06	6.60	1.58E-06	5.90	1.76E-07	2.63
5.22E-06	6.47	1.45E-06	5.78	1.69E-07	2.58
4.70E-06	6.34	1.34E-06	5.67	1.54E-07	2.53
4.24E-06	6.22	1.25E-06	5.56	1.44E-07	2.47
3.95E-06	6.09	1.16E-06	5.45	1.35E-07	2.41
3.55E-06	5.98	1.11E-06	5.34	1.32E-07	2.35
3.24E-06	5.85	1.02E-06	5.23	1.32E-07	2.29
3.12E-06	5.74	9.54E-07	5.13	1.30E-07	2.25
2.93E-06	5.63	9.12E-07	5.03	1.21E-07	2.20
2.63E-06	5.51	8.64E-07	4.93	1.11E-07	2.16
2.31E-06	5.41	8.17E-07	4.83	1.03E-07	2.12
2.12E-06	5.30	7.69E-07	4.73	1.20E-07	2.32
1.94E-06	5.19	7.41E-07	4.64	1.51E-07	2.35
1.74E-06	5.09	7.30E-07	4.55	1.85E-07	2.40
1.58E-06	4.99	7.59E-07	4.55	1.95E-07	2.46
1.40E-06	4.89	7.40E-07	4.48	2.04E-07	2.54
1.25E-06	4.80	6.52E-07	4.40	2.12E-07	2.62
1.14E-06	4.70			2.29E-07	2.70
1.05E-06	4.61			2.57E-07	2.79
9.61E-07	4.52			2.79E-07	2.87
8.76E-07	4.43			3.02E-07	2.96
8.12E-07	4.34			3.28E-07	3.06
7.54E-07	4.25			3.55E-07	3.15
6.85E-07	4.17			3.66E-07	3.25
6.17E-07	4.08			4.15E-07	3.34
5.58E-07	4.00			4.44E-07	3.45
5.14E-07	3.92			4.85E-07	3.55
4.82E-07	3.85			5.28E-07	3.66
4.53E-07	3.77			5.71E-07	3.77
4.25E-07	3.70			6.10E-07	3.89
4.18E-07	3.62			6.56E-07	4.00
4.13E-07	3.55			7.12E-07	4.12
3.95E-07	3.48			7.76E-07	4.25
3.86E-07	3.41			8.57E-07	4.38
3.68E-07	3.34			9.19E-07	4.51
3.46E-07	3.28			1.01E-06	4.66
3.39E-07	3.21			1.09E-06	4.80
3.22E-07	3.15			1.17E-06	4.94
2.96E-07	3.09			1.28E-06	5.09
2.79E-07	3.02			1.39E-06	5.24
2.71E-07	2.96			1.52E-06	5.41
2.69E-07	2.91			1.65E-06	5.57
2.51E-07	2.85			1.77E-06	5.74
2.38E-07	2.79			1.92E-06	5.92
				2.11E-06	6.10
				2.28E-06	6.28
				2.49E-06	6.47
				2.70E-06	6.66
				2.91E-06	6.87
				3.14E-06	7.07
				3.45E-06	7.29
				3.71E-06	7.52
				4.01E-06	7.75
				4.46E-06	7.99
				4.84E-06	8.24
				5.20E-06	8.48
				5.66E-06	8.73
				6.08E-06	8.99
				6.60E-06	9.26
				7.35E-06	9.55
				8.01E-06	9.84
				8.68E-06	10.15

TABLE B45. FATIGUE CRACK GROWTH RATE RESULTS FOR 8009 EXTRUSION
(L-T ORIENTATION, ROOM TEMP, 300 F, AND 450 F) NASA-LANGLEY.

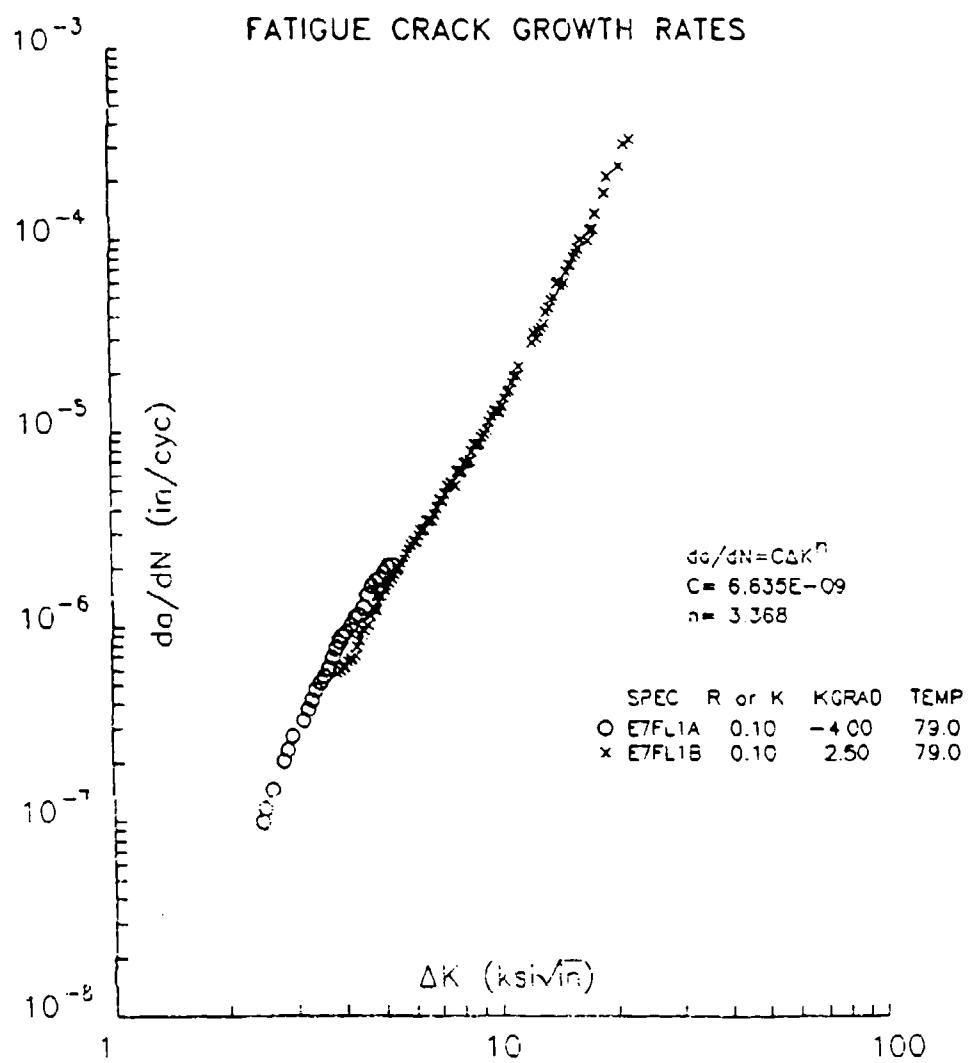


FIGURE B7. FATIGUE CRACK GROWTH RATE RESULTS FOR 8009 EXTRUSION (L-T ORIENTATION, ROOM TEMPERATURE) NORTHRUP.

AUTOMATED FATIGUE CRACK GROWTH RATE ANALYSIS

Specimen Id: E7FL1A Geometry: C/T
 Contract #: NNM705CN Orientation: L-T
 Material: 8009 Bar Yield (ksi): 55.0
 Temperature (F): 79 Modulus: 12.7
 Environment: Lab. air

Specimen Dimensions (in)

Thickness	0.249	Notch depth	0.430
Width	2.008	Gage length	1.000
Height	1.200	Alpha ratio	1.250

Precrack Parameters

Preax (in)	432.0	Stress ratio (R)	0.10
Final a (in)	0.499	Kmax	6.00

Test Parameters

Initial a (in)	0.499	Initial K	6.00
K-gradient	-4.00	Stress ratio (R)	0.10

K Coeff	EVB/P Coeff	Analysis Codes
0.886300	1.000900	KRP 2 0
4.640000	-4.669510	
-13.320000	18.460100	
14.725000	+236.824997	
-5.600000	1214.880000	
0.000000	-2143.570100	

Visual Observations

EVB/P	Crack (EVB/P)	Crack (visual)	Error	CAF
20.53	0.491	0.494	0.003	1.000
24.62	0.595	0.584	-.012	1.000
25.36	0.612	0.599	-.013	1.000
26.75	0.642	0.619	-.022	1.000
27.02	0.647	0.630	-.017	1.000
29.35	0.674	0.650	-.024	1.000
30.21	0.708	0.680	-.028	1.000
33.01	0.755	0.737	-.016	1.000
48.94	0.952	0.950	-.002	1.000
50.98	0.971	0.969	-.022	1.000
55.84	1.013	0.996	-.016	1.000
60.93	1.051	1.044	-.007	1.000
67.38	1.094	1.091	-.003	1.000
71.37	1.129	1.125	-.004	1.000

Specimen Id: E7FL1A

Pass	EVB/P	a (in)	N	da	ΔN	ΔΔN/ΔN	ΔK	Page
(100)	(100)	(X1)	(X1)	(in)	(X1)	(10 ³ /cyc)	(ksi/in)	
401	20.71	0.4963	3309		25.9	2.073E-06	5.79	
420	21.54	0.5053	7610	0.0156	6.03	2.241E-06	5.13	
403	21.27	0.5119	10827	0.0125	5993	1.916E-06	5.11	
391	21.49	0.5176	13713	0.0115	6782	1.760E-06	4.89	
378	21.70	0.5233	16817	0.0119	7169	1.725E-06	4.76	
367	21.94	0.5297	20496	0.0124	7120	1.631E-06	4.67	
355	22.17	0.5357	23986	0.0116	7974	1.458E-06	4.35	
344	22.39	0.5413	27614	0.0116	9554	1.252E-06	4.15	
333	22.62	0.5473	31960	0.0120	10825	1.150E-06	4.34	
323	22.86	0.5533	37168	0.0124	11200	1.122E-06	4.24	
312	23.12	0.5598	42135	0.0126	114.5	1.314E-06	4.14	
302	23.37	0.5655	45510	0.0118	12722	9.372E-07	4.03	
293	23.60	0.5716	54461	0.0119	13370	9.006E-07	3.94	
264	23.86	0.5776	61091	0.0120	14265	8.382E-07	3.85	
275	24.11	0.5836	67770	0.0120	16306	7.702E-07	3.75	
266	24.37	0.5897	73356	0.0126	17719	6.920E-07	3.66	
258	24.65	0.5962	84085	0.0123	18932	6.099E-07	3.58	
250	24.91	0.6020	93074	0.0116	21493	5.585E-07	3.49	
242	25.16	0.6077	103866	0.0120	23370	5.214E-07	3.41	
234	25.45	0.6140	114567	0.0122	24947	4.735E-07	3.33	
227	25.72	0.6199	126436	0.0118	28660	4.204E-07	3.25	
220	25.99	0.6258	139514	0.0120	32502	3.766E-07	3.17	
213	26.28	0.6320	155596	0.0122	36658	3.291E-07	3.10	
206	26.57	0.6381	172016	0.0120				
	26.86	0.6440	191754					
	27.10	0.6489	215598					
188	27.45	0.6560	239034	0.0128	46694	2.737E-07	2.99	
182	27.74	0.6618	262493	0.0119	50826	2.336E-07	2.81	
176	28.05	0.6670	289910	0.0123	60178	2.046E-07	2.75	
	28.31	0.6741	322671					
	28.64	0.6792	367640					
160	29.03	0.6866	413087	0.0133	91528	1.453E-07	2.50	
155	29.35	0.6924	459167	0.0118	101006	1.165E-07	2.49	
150	29.67	0.6983	514932	0.0114	114742	9.933E-08	2.43	
	29.97	0.7038	573910					

E 846. FATIGUE CRACK GROWTH RATE RESULTS FOR 8009 EXTRUSION (L-T ORIENTATION, ROOM TEMPERATURE) SPECIMEN #E7FL1A, NORTHROP.

AUTOMATED FATIGUE CRACK GROWTH RATE ANALYSIS

Specimen Id. E7FL1B Geometry C/T:
 Contract # 44470524 Orientation L-T
 Material 6069 Bar Yield (kpsi) 35.0
 Temperature (F) 79 Modulus 12.7
 Environment Lab. air

Specimen Dimensions (in)

Thickness	0.249	Match depth	0.030
Width	2.000	Gage length	1.000
Height	1.200	Alpha ratio	1.250

Prefrack Parameters

Pinch (lbs)	432.0	Stress ratio (R)	0.10
Final a (in)	0.499	Kmax	6.00

Test Parameters

Initial a (in)	0.708	Initial K	4.00
K-gradient	2.50	Stress ratio (R)	0.10

K Coeff	E-B/P Coeff	Analysis Codes
0.886000	1.000960	KRP 2 0
4.640000	-4.665510	
-13.320000	18.463100	
14.720000	-236.824997	
-5.600000	1214.880000	
0.000000	-2143.570100	

Specimen Id. E7FL1B

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Power	E48/P	a	H	Δa	ΔN	ΔΔ/ΔN	ΔK
(lbs)	(in)	(in)	(in)	(in)	(in)	(in/cyc)	(kpsi/in)
21	31.01	0.7221	25349				
225	31.37	0.7284	36270	0.0123	21419	5.730E-07	3.79
226	31.73	0.7343	46768	0.0122	20432	5.991E-07	3.85
228	32.10	0.7406	56702	0.0120	19471	6.146E-07	3.90
230	32.45	0.7463	66239	0.0118	18777	6.275E-07	3.96
231	32.83	0.7524	75419	0.0124	18675	6.626E-07	4.02
233	33.22	0.7587	84914	0.0123	18287	6.747E-07	4.08
235	33.61	0.7647	93765	0.0121	17772	6.804E-07	4.15
237	34.00	0.7708	102685	0.0122	17064	7.140E-07	4.21
238	34.40	0.7769	110829	0.0117	14917	7.860E-07	4.27
240	34.77	0.7825	117602	0.0114	13487	8.485E-07	4.34
242	35.17	0.7883	124316	0.0120	13249	9.021E-07	4.40
243	35.58	0.7944	130851	0.0123	12784	9.660E-07	4.47
245	36.02	0.8007	137130	0.0122	11995	1.019E-06	4.54
247	36.44	0.8067	142846	0.0128	11229	1.137E-06	4.61
249	36.92	0.8135	148329	0.0126	10261	1.226E-06	4.68
251	37.34	0.8193	153127	0.0116	9489	1.219E-06	4.75
252	37.77	0.8250	157818	0.0120	8936	1.342E-06	4.83
254	38.24	0.8313	162063	0.0112	7833	1.432E-06	4.89
256	38.61	0.8362	165852	0.0115	7947	1.442E-06	4.97
258	39.11	0.8427	170011	0.0134	8685	1.546E-06	5.04
259	39.66	0.8497	174337	0.0123	7586	1.616E-06	5.12
261	40.08	0.8556	177597	0.0111	6625	1.672E-06	5.20
263	40.54	0.8620	180962	0.0123	6825	1.760E-06	5.28
265	41.06	0.8670	184422	0.0127	6783	1.872E-06	5.36
267	41.59	0.8734	187742	0.0125	6354	1.963E-06	5.44
269	42.10	0.8795	190776	0.0115	5749	2.007E-06	5.52
270	42.56	0.8850	191491	0.0117	5249	2.102E-06	5.51
272	43.12	0.8911	196325	0.0119	5310	2.236E-06	5.69
274	43.62	0.8966	198002	0.0117	4942	2.356E-06	5.77
276	44.16	0.9028	201267	0.0125	5075	2.464E-06	5.86
278	44.76	0.9093	203077	0.0129	4913	2.602E-06	5.95
279	45.34	0.9156	206187	0.0110	4322	2.736E-06	6.04
281	45.97	0.9212	208198	0.0114	4163	2.734E-06	6.13
283	46.43	0.9270	210350	0.0119	4059	2.938E-06	6.22
285	47.03	0.9331	212257	0.0114	3679	3.103E-06	6.31
287	47.55	0.9384	214026	0.0114	3645	3.137E-06	6.41
288	48.18	0.9445	215902	0.0133	3795	3.493E-06	6.51
290	48.9	0.9516	217824	0.0130	3742	3.470E-06	6.61
292	49.52	0.9575	219644	0.0117	3346	3.484E-06	6.72
294	50.14	0.9633	221169	0.0118	3143	3.750E-06	6.82
296	50.79	0.9693	222786	0.0127	3137	4.081E-06	6.92
298	51.53	0.9760	224276	0.0123	2758	4.475E-06	7.02
300	52.16	0.9816	225544	0.0113	2571	4.392E-06	7.13
301	52.81	0.9873	226847	0.0124	2602	4.762E-06	7.25
303	53.60	0.9941	229146	0.0136	2650	5.233E-06	7.36
306	54.41	1.0009	229447	0.0172	3142	5.460E-06	7.52
307	55.67	1.0112	231289	0.0119	2167	5.444E-06	7.60
309	55.95	1.0112	231614	0.0058	1099	5.260E-06	7.74

TABLE B47. FATIGUE CRACK GROWTH RATE RESULTS FOR 6069 EXTRUSION (L-T ORIENTATION, ROOM TEMPERATURE) SPECIMEN #E7FL1B, NORTHROP.

Specimen	E _{08/P}	a	M	ΔM	ΔN	Δ _{0.5} ΔN	ΔK
(10 ³)	(10 ³ /cyc)	(kN ² /in ²)					
3:0	56.39	1.0170	232388	0.0107	1710	6.239E-06	7.81
3:2	57.20	1.0233	231324	0.0120	1910	6.267E-06	7.91
3:4	57.93	1.0290	234298	0.0121	1947	6.236E-06	8.04
3:5	58.78	1.0355	235271	0.0126	1829	6.064E-06	8.16
3:7	59.60	1.0415	236127	0.0117	1677	6.967E-06	8.26
3:9	60.37	1.0472	236948	0.0116	1634	7.080E-06	8.41
321	61.20	1.0531	237761	0.0124	1571	7.875E-06	8.53
322	62.11	1.0595	238519	0.0129	1492	8.571E-06	8.67
324	63.04	1.0659	239253	0.0117	1368	8.533E-06	8.79
326	63.82	1.0712	239865	0.0113	1298	8.678E-06	8.93
327	64.72	1.0772	240551	0.0122	1299	9.364E-06	9.06
329	65.68	1.0834	241186	0.0124	1274	9.713E-06	9.20
330	66.65	1.0895	241825	0.0119	1169	1.020E-05	9.34
332	67.57	1.0953	242354	0.0120	1068	1.124E-05	9.48
334	68.59	1.1015	242893	0.0121	1010	1.209E-05	9.62
335	69.56	1.1074	243164	0.0123	965	1.277E-05	9.78
337	70.67	1.1139	243658	0.0123	975	1.261E-05	9.92
338	71.58	1.1197	244338	0.0117	931	1.262E-05	10.09
340	72.73	1.1256	244799	0.0126	932	1.349E-05	10.23
342	73.93	1.1322	245270	0.0124	833	1.489E-05	10.38
343	75.00	1.1380	245621	0.0116	729	1.591E-05	10.55
345	76.10	1.1438	245999	0.0131	811	1.621E-05	10.72
346	77.52	1.1512	246442	0.0127	710	1.785E-05	10.87
347	78.58	1.1565	246709	0.0105	552	1.904E-05	11.04
349	79.62	1.1617	246985	0.0114	588	1.937E-05	11.20
350	80.90	1.1679	247297	0.0125	577	2.161E-05	11.36
	82.22	1.1741	247561				
83.12	1.1782	247789					
84.52	1.1847	248113					
86.53	1.1936	248555					
257	87.56	1.1981	248736	0.0113	389	2.905E-05	12.29
358	89.18	1.2049	248944	0.0130	399	3.257E-05	12.46
259	90.67	1.2111	249135	0.0116	383	3.043E-05	12.65
360	92.03	1.2166	249327	0.0120	358	3.350E-05	12.85
361	93.66	1.2223	249494	0.0116	354	3.457E-05	13.02
362	95.00	1.2282	249661	0.0113	310	3.649E-05	13.23
363	96.55	1.2344	249803	0.0124	298	4.172E-05	13.42
364	98.35	1.2406	249959	0.0141	324	4.351E-05	13.66
355	100.55	1.2485	250127	0.0131	273	4.796E-05	13.84
366	102.06	1.2537	250232	0.0100	200	4.981E-05	14.01
367	103.44	1.2584	250327	0.0118	201	5.673E-05	14.29
368	105.58	1.2655	250433	0.0127	213	5.971E-05	14.46
369	107.32	1.2711	250540	0.0121	213	5.675E-05	14.72
370	109.36	1.2776	250646	0.0125	212	5.885E-05	14.94
370	111.34	1.2836	250752	0.0126	187	6.715E-05	15.19
371	113.51	1.2901	250833	0.0119	164	7.267E-05	15.41
372	115.37	1.2955	250916	0.0120	164	7.331E-05	15.66
372	117.71	1.3022	250997	0.0121	152	7.972E-05	15.87
373	119.69	1.3076	251068	0.0127	152	8.345E-05	16.15
373	122.46	1.3149	251150	0.0134	151	8.689E-05	16.39
374	124.77	1.3211	251219	0.0125	127	9.892E-05	16.67
	127.29	1.3274	251276				
	129.86	1.3337	251334				
375	131.96	1.3387	251392	0.0113	115	9.814E-05	17.45
375	134.66	1.3450	251449	0.0128	115	1.113E-04	17.70
375	137.56	1.3516	251537	0.0130	116	1.120E-04	17.98
375	140.49	1.3580	251565	0.0138	102	1.151E-04	18.30
	144.00	1.3654	251609				
	146.47	1.3705	251642				
375	149.46	1.3765	251689	0.0170	99	1.1724E-04	19.26
375	155.22	1.3875	251740	0.0191	91	2.090E-04	19.60
	159.65	1.3955	251780				
	164.90	1.4047	251820				
374	168.52	1.4108	251860	0.0195	82	2.394E-04	21.05
373	176.99	1.4242	251932	0.0299	96	3.132E-04	21.65
371	188.21	1.4407	251955	0.0371	113	3.299E-04	22.58
	203.87	1.4613	252014				

TABLE B47. FATIGUE CRACK GROWTH RATE RESULTS FOR 8009 EXTRUSION
(L-T ORIENTATION, ROOM TEMPERATURE) SPECIMEN #E7FL1B, NORTHROP. (continued)

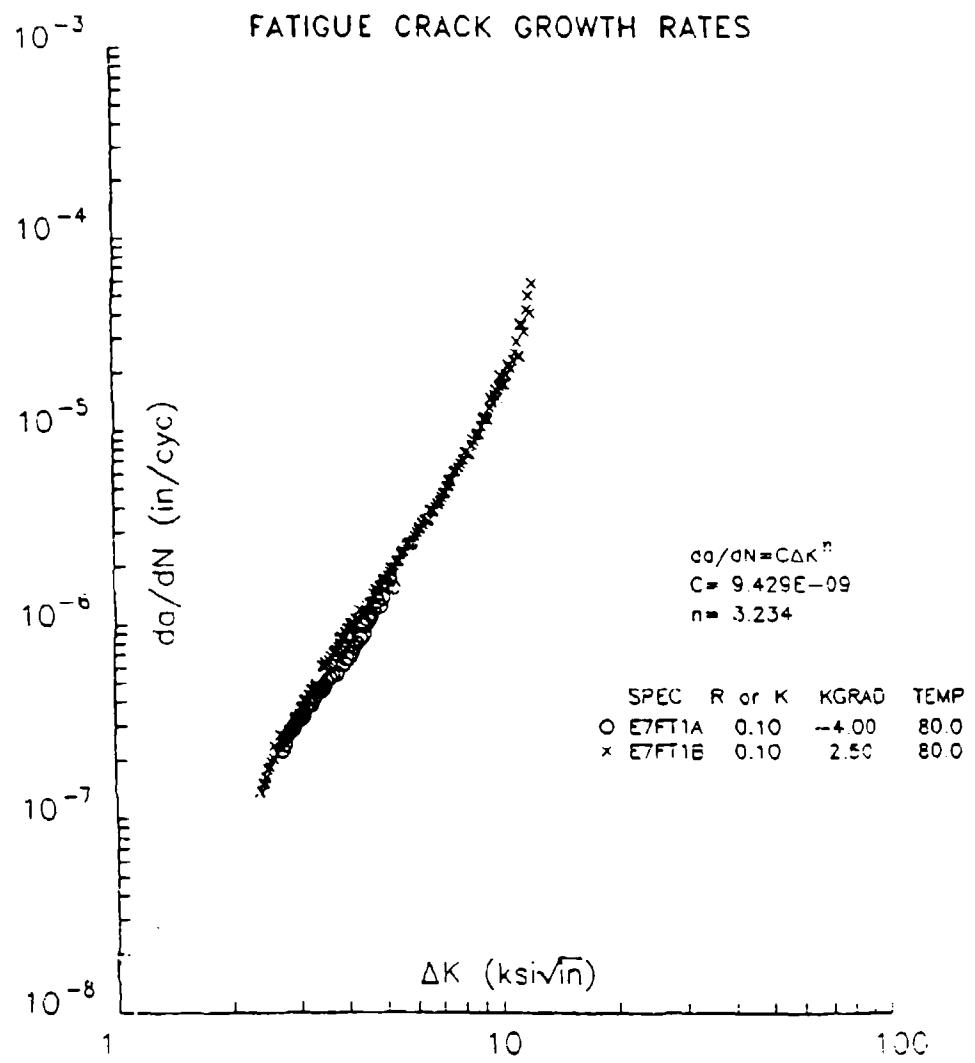


FIGURE B8. FATIGUE CRACK GROWTH RATE RESULTS FOR 8009 EXTRUSION (T-L ORIENTATION, ROOM TEMPERATURE) NORTHROP.

AUTOMATED FATIGUE CRACK GROWTH RATE ANALYSIS

Specimen Id.	E7FT1A	Geometry	C(T)
Contract #	WNH7052H	Orientation	T-L
Material	8009 Extr.	Yield (ksi)	55.0
Temperature (F)	80	Modulus	12.8
Environment	Lab. air		

Specimen Dimensions (in)			
Thickness	0.250	Notch depth	0.414
Width	2.002	Gage-length	1.000
Height	1.200	Alpha ratio	1.250

Prestress Parameters			
Pmax (lbs)	430.0	Stress ratio (R)	0.10
Final a (in)	0.503	Kmax	6.01

Test Parameters			
Initial a (in)	0.503	Initial K	6.00
K-gradient	-4.00	Stress ratio (R)	0.10

K Coeff	EiB/P Coeff	Analysis Codes
0.936000	1.000980	KRF 2 0
4.640000	-4.669710	
-13.320000	18.401000	
14.720000	-236.324997	
-5.600000	1214.380000	
0.000000	-2145.570100	

Specimen Id. E7FT1A							Page	1
Pmax (lbs)	EiB/P (in)	a (in)	N (X1)	da/dN (in)	dN (in/cyc)	da/dN (ksi/in)		
21.10	0.5057	1113						
414	21.22	0.5090	3952	0.0090	3820	1.547E-06	5.25	
406	21.43	0.5147	6933	0.0095	5538	1.717E-06	5.18	
395	21.57	0.5186	9490	0.0084	5335	1.572E-06	5.07	
387	21.74	0.5231	12249	0.0084	5144	1.625E-06	5.00	
379	21.89	0.5170	14456	0.0073	5264	1.385E-06	4.92	
370	22.02	0.5304	17532	0.0081	6366	1.241E-06	4.82	
363	22.20	0.5351	21223	0.0091	6919	1.322E-06	4.76	
355	22.37	0.5395	24451	0.0077	6294	1.229E-06	4.68	
347	22.50	0.5428	27507	0.0072	6520	1.104E-06	4.61	
341	22.56	0.5447	30971	0.0078	7205	1.080E-06	4.54	
334	22.81	0.5506	34711	0.0080	7420	1.048E-06	4.47	
327	22.98	0.5547	38591	0.0080	8033	9.972E-07	4.40	
320	23.13	0.5586	42744	0.0078	8766	8.720E-07	4.33	
313	23.29	0.5625	47552	0.0093	10211	8.302E-07	4.26	
306	23.48	0.5649	52765	0.0093	10363	8.030E-07	4.19	
310	23.64	0.5708	57922	0.0078	10302	7.607E-07	4.12	
294	23.83	0.5743	63073	0.0077	10313	7.074E-07	4.06	
287	23.96	0.5785	69733	0.0079	11229	6.641E-07	3.99	
281	24.14	0.5827	74901	0.0084	12726	6.599E-07	3.93	
276	24.31	0.5869	81481	0.0080	12860	6.250E-07	3.87	
	24.43	0.5907	87761					
	24.55	0.5921	99733					
	24.85	0.5989	111862	0.0106	10133	5.557E-07	3.71	
	25.02	0.6028	113891	0.0079	14441	5.424E-07	3.62	
	25.20	0.5963	124303	0.0082	15714	5.311E-07	3.57	
	25.39	0.5111	134805	0.0085	15624	5.101E-07	3.51	
	25.51	0.5153	142927	0.0076	16057	4.773E-07	3.43	
	25.74	0.5183	150609	0.0073	16649	4.552E-07	3.40	
	25.94	0.5222	159576	0.0082	17933	4.592E-07	3.35	
	26.12	0.5270	163541	0.0085	18717	4.553E-07	3.29	
	26.34	0.5314	178163	0.0081	15175	4.204E-07	3.24	
	26.51	0.5351	187717	0.0073	19463	3.861E-07	3.19	
	26.70	0.5389	197642	0.0081	20593	3.923E-07	3.14	
	26.90	0.5431	206316	0.0079	20996	3.743E-07	3.09	
	27.08	0.5463	218444	0.0077	22298	3.437E-07	3.04	
	27.29	0.5508	230614	0.0083	25353	3.263E-07	2.93	
	27.50	0.5551	243998	0.0081	26427	3.237E-07	2.94	
	27.71	0.5594	257041	0.0081	26105	3.118E-07	2.90	
	27.91	0.5632	270103	0.0077	24365	2.892E-07	2.87	
	28.11	0.5671	292703	0.0077	24676	2.807E-07	2.81	
	28.29	0.5707	296759	0.0078	25610	2.667E-07	2.76	
	28.52	0.5747	312316	0.0083	34792	2.412E-07	2.71	
	28.73	0.5790	321350	0.0081	36086	2.272E-07	2.66	
	28.93	0.5823	342403					

TABLE B48. FATIGUE CRACK GROWTH RATE RESULTS FOR 8009 EXTRUSION (T-L ORIENTATION, ROOM TEMPERATURE) SPECIMEN #E7FT1A, NORTHROP.

AUTOMATED FATIGUE CRACK GROWTH RATE ANALYSIS

Specimen Id. E7FT1B Geometry C-T
 Contract # NORTHROP Orientation T-L
 Material 8009 E-t. Yield (psi) 55,000
 Temperature (F) 80 Modulus 11.1
 Environment Lab. air

Specimen Dimensions (in)

Thickness 0.250 Notch depth 0.414
 Width 2.002 Gage length 1.000
 Height 1.200 Alpha ratio 1.200

Precrack Parameters

P_{0a} (lbs) 400.0 Stress ratio (R) 0.1
 Final a (in) 0.503 R_{ms} 1.00

Test Parameters

Initial a (in) 0.710 Initial K₁ 2.80
 R-ratio 0.50 Stress ratio (R) 0.1

I	Coef ²	E-8.1 Coef ²	Analytic Coef ²
0.9850000	1.0000000	KRF = 2.00	
4.5400000	-4.4649113		
-11.2200000	18.4301000		
14.7200000	-236.6249987		
-7.0000000	1214.8300000		
0.0000000	-2143.5701000		

Specimen Id. E7FT1B								Page 1
P _{0a} (lbs)	E-8/P	a (in)	N (X1)	ΔP (in)	ΔN (X1)	ΔP/ΔN (in/cyc)	ΔP (psi/in)	
30.47	0.7107	750						
143	30.57	0.7124	14396	0.0040	43475	1.375E-07	2.35	
143	30.81	0.7147	44723	0.0084	55509	1.513E-07	2.38	
144	31.05	0.7208	72004	0.0084	55019	1.521E-07	2.41	
145	31.30	0.7251	99747	0.0097	58346	1.545E-07	2.43	
146	31.56	0.7295	124851	0.0086	47733	1.791E-07	2.46	
143	31.81	0.7337	147534	0.0083	44532	1.357E-07	2.48	
147	32.06	0.7173	169282	0.0083	45457	1.942E-07	2.51	
148	32.35	0.7425	192991	0.0086	42929	2.054E-07	2.54	
149	32.60	0.7466	212272	0.0049	28676	2.375E-07	2.57	
32.77	0.7493	221943						
32.26	0.7572	229549						
151	33.40	0.7593	230460	0.0052	19310	2.694E-07	2.65	
151	33.60	0.7624	244875	0.0076	33057	2.308E-07	2.67	
152	33.89	0.7670	263557	0.0085	34208	2.475E-07	2.70	
153	34.15	0.7710	279047	0.0076	29266	2.599E-07	2.73	
154	34.36	0.7743	292922	0.0078	29012	2.499E-07	2.77	
155	34.56	0.7757	308079	0.0087	30986	2.324E-07	2.78	
156	34.97	0.7833	323709	0.0086	29415	2.409E-07	2.81	
157	35.24	0.7871	337494	0.0081	26241	2.005E-07	2.84	
157	35.52	0.7914	250451	0.0021	25100	3.243E-07	2.87	
158	35.80	0.7954	362594	0.0077	23061	3.731E-07	2.90	
159	36.06	0.7991	373732	0.0077	23352	3.241E-07	2.93	
159	36.34	0.8031	384456	0.0084	24409	3.431E-07	2.96	
160	36.62	0.8074	398141	0.0082	22422	3.675E-07	2.99	
161	36.93	0.8113	406877	0.0080	21244	3.751E-07	3.02	
161	37.22	0.8174	419288	0.0078	19402	4.000E-07	3.05	
162	37.51	0.8192	428479	0.0075	18478	4.084E-07	3.08	
163	37.72	0.8220	437863	0.0076	18737	4.023E-07	3.11	
164	38.07	0.8267	447266	0.0081	16829	4.291E-07	3.14	
164	38.37	0.8310	456691	0.0084	18492	4.544E-07	3.17	
165	38.71	0.8352	465760	0.0089	17298	4.638E-07	3.20	
165	39.01	0.8391	473979	0.0083	17257	4.801E-07	3.22	
167	39.35	0.8424	483017	0.0082	16403	4.979E-07	3.27	
39.41	0.8472	490382						
39.73	0.8489	505614						
169	40.30	0.8553	521901	0.0107	22773	4.697E-07	3.36	
170	40.64	0.8575	533393	0.0076	12449	6.210E-07	3.40	
171	40.93	0.8621	534401	0.0077	12517	6.128E-07	3.44	
171	41.21	0.8672	540904	0.0081	12752	6.264E-07	3.47	
172	41.61	0.8712	547152	0.0080	12775	6.271E-07	3.50	
172	41.95	0.8752	553659	0.0081	12253	6.577E-07	3.53	
174	42.30	0.8773	559510	0.0079	11492	6.824E-07	3.57	
174	42.64	0.8811	565101	0.0077	11245	6.212E-07	3.61	
175	42.94	0.8871	570874	0.0073	10947	7.106E-07	3.64	
176	43.31	0.8910	576153	0.0010	10913	7.274E-07	3.67	
177	43.63	0.8951	581357	0.0032	11124	7.402E-07	3.70	

TABLE B49. FATIGUE CRACK GROWTH RATE RESULTS FOR 8009 EXTRUSION (T-L ORIENTATION, ROOM TEMPERATURE) SPECIMEN #E7FT1B, NORTHROP.

Pass (ID#)	E-Value (in)	N (in)	S (in)	A/P (in)	A/P (in)	Page 2		
						10 ¹⁰ /in ²	10 ¹⁰ /in ² /in	10 ¹⁰ /in ² /in ²
171	44.04	0.9472	517292	0.00012	10647	7.444E-07	3.76	
171	44.43	0.9012	527091	0.00013	10710	7.310E-07	3.77	
175	44.30	0.9072	537111	0.00010	9624	8.340E-07	2.11	
180	45.17	0.9113	402127	0.00011	9621	8.362E-07	2.17	
181	45.37	0.9154	406443	0.00011	9439	8.324E-07	2.01	
182	45.93	0.9194	411162	0.00011	9034	9.077E-07	2.23	
182	46.26	0.9237	616037	0.00011	8601	9.454E-07	3.43	
183	46.74	0.9276	620117	0.00011	7748	9.613E-07	4.01	
184	47.12	0.9314	624005	0.00011	7565	1.004E-06	4.07	
185	47.49	0.9352	627791	0.00011	7716	9.661E-07	4.11	
185	47.88	0.9389	631722	0.00011	7411	1.025E-06	4.15	
186	48.25	0.9430	635420	0.00011	7711	1.071E-06	4.14	
187	48.73	0.9473	639492	0.00011	8071	1.045E-06	4.24	
188	49.14	0.9514	643493	0.00011	6027	1.187E-05	4.33	
188	49.63	0.9554	648529	0.00011	6277	1.126E-05	4.32	
189	49.76	0.9570	647173	0.00011	6670	1.109E-05	4.27	
190	50.39	0.9629	651125	0.00011	6621	1.191E-05	4.41	
191	50.81	0.9648	654515	0.00011	6639	1.247E-05	4.47	
192	51.30	0.9712	658993	0.00011	6325	1.247E-05	4.50	
192	51.79	0.9753	663311	0.00011	6421	1.226E-05	4.55	
193	52.23	0.9795	666329	0.00011	5631	1.354E-05	4.59	
194	52.67	0.9833	667014	0.00011	5195	1.444E-05	4.64	
195	53.09	0.9870	671124	0.00011	5311	1.521E-05	4.68	
195	53.41	0.9914	674225	0.00011	5365	1.550E-05	4.73	
196	54.07	0.9953	676989	0.00011	5435	1.493E-05	4.78	
197	54.53	0.9995	679761	0.00011	5430	1.562E-05	4.83	
198	55.10	1.0038	681419	0.00011	4967	1.522E-05	4.88	
199	55.54	1.0074	682473	0.00011	4733	1.675E-05	4.93	
199	56.08	1.0117	687152	0.00011	4570	1.699E-05	4.98	
200	56.40	1.0138	689998	0.00012	4955	1.705E-05	5.01	
201	57.13	1.0200	692010	0.00012	4412	1.773E-05	5.08	
202	57.61	1.0237	693410	0.00012	4009	1.852E-05	5.13	
203	58.10	1.0275	695013	0.00012	3953	1.940E-05	5.18	
203	58.42	1.0312	697783	0.00012	4117	1.939E-05	5.22	
204	59.17	1.0354	700116	0.00012	4124	1.933E-05	5.23	
204	59.71	1.0394	701112	0.00012	3843	2.087E-05	5.24	
205	60.25	1.0432	701379	0.00012	3773	2.107E-05	5.29	
205	60.91	1.0474	705889	0.00012	3867	2.124E-05	5.44	
207	61.41	1.0517	707346	0.00012	3624	2.264E-05	5.79	
207	61.97	1.0556	707514	0.00012	3244	2.351E-05	5.85	
208	62.52	1.0593	711109	0.00012	3337	2.357E-05	5.91	
209	63.13	1.0636	712381	0.00011	3216	2.489E-05	5.96	
210	63.71	1.0675	714370	0.00011	3067	2.561E-05	5.97	
210	64.31	1.0714	715920	0.00011	3021	2.579E-05	5.97	
211	64.79	1.0753	717397	0.00011	2785	2.577E-05	5.97	
212	65.41	1.0786	718705	0.00011	2999	2.621E-05	5.98	
212	66.11	1.0831	720319	0.00011	3176	2.711E-05	6.01	
213	66.74	1.0877	722361	0.00011	3077	2.711E-05	6.01	
214	67.50	1.0916	723472	0.00011	3137	2.875E-05	6.08	
214	68.14	1.0957	724759	0.00011	3444	1.089E-05	5.14	
215	68.73	1.0994	725917	0.00011	2323	3.140E-05	5.20	
215	69.36	1.1031	726787	0.00012	2435	3.371E-05	5.25	
216	70.11	1.1075	729322	0.00012	2522	3.245E-05	5.32	
217	70.76	1.1113	729420	0.00012	2294	3.416E-05	5.39	
218	71.52	1.1157	730747	0.00012	2300	3.471E-05	5.45	
218	72.16	1.1193	731920	0.00012	2311	3.443E-05	5.52	
219	72.95	1.1236	733057	0.00012	2046	3.374E-05	5.58	
220	73.60	1.1273	733986	0.00012	1961	3.651E-05	5.63	
220	74.32	1.1312	735018	0.00012	2162	3.810E-05	5.71	
221	75.14	1.1356	736147	0.00012	2166	4.027E-05	5.78	
222	75.96	1.1399	737184	0.00012	2037	4.153E-05	5.85	
222	76.76	1.1441	739184	0.00011	1936	4.164E-05	5.92	
223	77.52	1.1480	739120	0.00011	1777	4.257E-05	5.99	
223	78.26	1.1517	739961	0.00011	1793	4.523E-05	6.07	
224	79.15	1.1561	740919	0.00011	1766	4.744E-05	7.14	
225	79.95	1.1601	741725	0.00012	1577	4.312E-06	7.21	
225	80.70	1.1637	742426	0.00012	1538	5.125E-06	7.28	
226	81.52	1.1671	743254	0.00012	1496	5.511E-05	7.35	
226	82.34	1.1714	743504	0.00012	1438	5.117E-05	7.41	
227	83.13	1.1751	744702	0.00011	1592	5.473E-05	7.50	
227	84.11	1.1800	745484	0.00012	1447	6.023E-05	7.58	
228	85.13	1.1841	746145	0.00012	1290	4.404E-05	7.66	
228	85.97	1.1871	745774	0.00012	1220	5.174E-05	7.73	
229	86.85	1.1917	747384	0.00012	1163	6.404E-05	7.80	
229	87.69	1.1951	747937	0.00012	1124	6.411E-05	7.83	
230	88.54	1.1993	748452	0.00012	1147	5.711E-05	7.95	
230	89.32	1.2021	749084	0.00012	1134	7.058E-05	8.03	
231	90.47	1.2062	749627	0.00012	1091	7.558E-05	8.11	
231	91.65	1.2112	750175	0.00012	1115	7.715E-05	8.20	
232	92.82	1.2157	750743	0.00012	1074	7.417E-05	8.36	
232	93.52	1.2193	751249	0.00012	1019	7.723E-05	8.38	
233	94.50	1.2231	751775	0.00012	962	8.215E-05	8.45	
233	95.76	1.2276	752241	0.00012	951	8.399E-05	8.54	
234	96.87	1.2317	752706	0.00011	726	3.773E-04	8.63	
234	97.37	1.2351	753170	0.00011	867	9.341E-05	8.71	
235	98.08	1.2371	753773	0.00012	848	3.618E-04	8.78	
235	99.25	1.2411	754019	0.00011	842	9.709E-06	8.89	
235	100.77	1.2471	754421	0.00011	734	1.044E-05	8.78	
236	101.77	1.2471	754782	0.00012	667	1.143E-05	8.87	
236	103.61	1.2555	755013	0.00012	637	1.146E-05	8.94	
237	104.38	1.2557	755440	0.00012	724	1.157E-05	8.95	
237	105.15	1.2613	755812	0.00011	721	1.111E-05	8.95	
237	107.40	1.2651	756170	0.00012	644	1.229E-05	8.98	
238	109.78	1.2711	756475	0.00012	715	1.477E-05	9.04	
238	109.89	1.2757	756705	0.00012	514	1.173E-05	9.04	
239	111.20	1.2781	756980	0.00012	792	1.173E-05	9.04	
239	112.77	1.2814	757117	0.00011	417	1.434E-05	9.04	
239	113.72	1.2877	757417	0.00011	412	1.474E-05	9.04	
240	114.71	1.2927	757711	0.00011	512	1.413E-05	9.04	
240	117.74	1.2977	758003	0.00012	490	1.171E-05	9.04	

TABLE B49. FATIGUE CRACK GROWTH RATE RESULTS FOR 8009 EXTRUSION
(T-L ORIENTATION, ROOM TEMPERATURE) SPECIMEN #E7FT1B, NORTHROP. (continued)

Specimen Id. E7FT1B							Page	4
Pmax (lbs)	E10/P (in)	S (X1)	N (in)	ΔS (X1)	ΔN (in/cyc)	Δ (in/in)		
239	118.22	1.2909	753193	0.0067	390	1.714E-05	10.11	
240	119.49	1.3034	753411	0.0079	463	1.714E-05	10.33	
240	121.14	1.3079	753641	0.0091	474	1.928E-05	10.44	
240	122.30	1.3125	753885	0.0087	401	2.168E-05	10.75	
240	124.47	1.3166	759062	0.0076	374	2.127E-05	10.16	
240	125.85	1.3201	759239	0.0074	347	2.047E-05	10.77	
241	127.48	1.3242	759429	0.0085	362	2.305E-05	10.38	
241	129.28	1.3286	759603	0.0097	387	2.512E-05	11.00	
241	131.49	1.3339	759816	0.0095	333	2.868E-05	11.11	
241	133.30	1.3381	759941	0.0062	275	2.417E-05	11.11	
241	134.13	1.3401	760071	0.0063	259	2.421E-05	11.39	
241	136.05	1.3444	760200	0.0087	245	3.755E-05	11.44	
241	138.00	1.3488	760316	0.0073	269	3.483E-05	11.54	
241	139.34	1.3517	760410	0.0081	256	3.208E-05	11.39	
241	141.30	1.3570	760572	0.0141	315	4.214E-05	11.85	
241	146.07	1.3658	760745	0.0101	205	4.763E-05	11.75	
241	146.71	1.3671	760777	0.0091	71	4.024E-05	12.11	
241	147.62	1.3690	760823	0.0067	117	6.300E-05	12.21	
	150.09	1.3738	760892					

TABLE B49. FATIGUE CRACK GROWTH RATE RESULTS FOR 8009 EXTRUSION
(T-L ORIENTATION, ROOM TEMPERATURE) SPECIMEN #E7FT1B, NORTHROP. (continued)

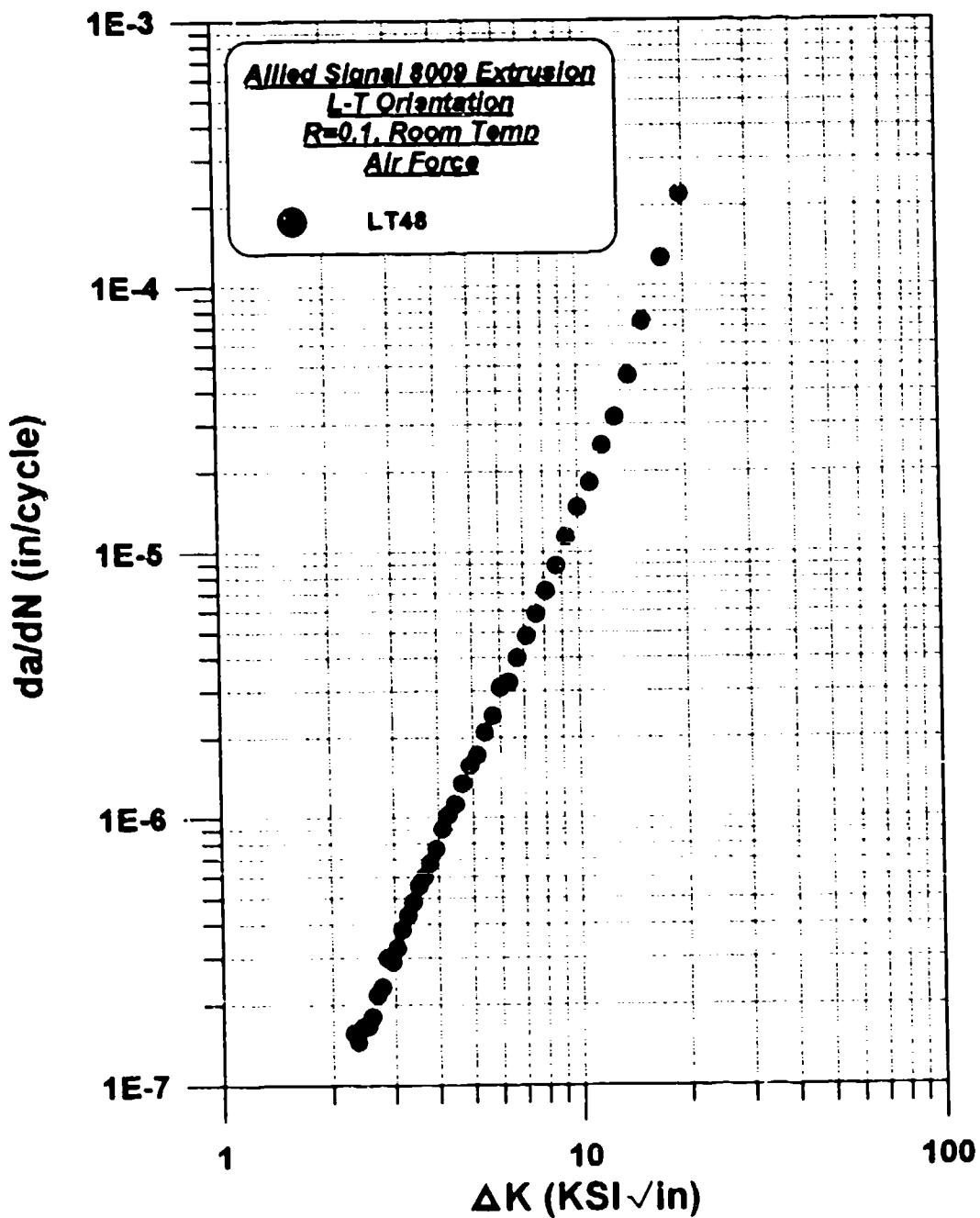


FIGURE B9. FATIGUE CRACK GROWTH RATE RESULTS FOR 8009 EXTRUSION
(L-T ORIENTATION, ROOM TEMPERATURE, R=0.1) AIR FORCE.

Allied Signal 8009 Extrusion
R = 0.1
L-T Orientation
Air Force
Room Temperature

Specimen # LT48
Delta K da/dN

2.29	1.57E-07
2.35	1.46E-07
2.43	1.66E-07
2.51	1.67E-07
2.58	1.81E-07
2.67	2.19E-07
2.75	2.33E-07
2.85	3.01E-07
2.95	2.92E-07
3.04	3.28E-07
3.14	3.82E-07
3.26	4.32E-07
3.38	4.83E-07
3.5	5.56E-07
3.63	5.98E-07
3.77	6.73E-07
3.93	7.60E-07
4.1	9.07E-07
4.27	1.02E-06
4.46	1.12E-06
4.67	1.34E-06
4.91	1.58E-06
5.15	1.72E-06
5.42	2.10E-06
5.7	2.42E-06
6	3.10E-06
6.36	3.25E-06
6.72	4.01E-06
7.14	4.83E-06
7.58	5.84E-06
8.1	7.14E-06
8.66	8.90E-06
9.26	1.14E-05
10	1.47E-05
10.83	1.81E-05
11.75	2.50E-05
12.77	3.19E-05
13.95	4.58E-05
15.36	7.31E-05
17.43	1.28E-04
19.76	2.21E-04

**TABLE B50. FATIGUE CRACK GROWTH RATE RESULTS FOR 8009 EXTRUSION
 (L-T ORIENTATION, ROOM TEMPERATURE, R=0.1) AIR FORCE.**

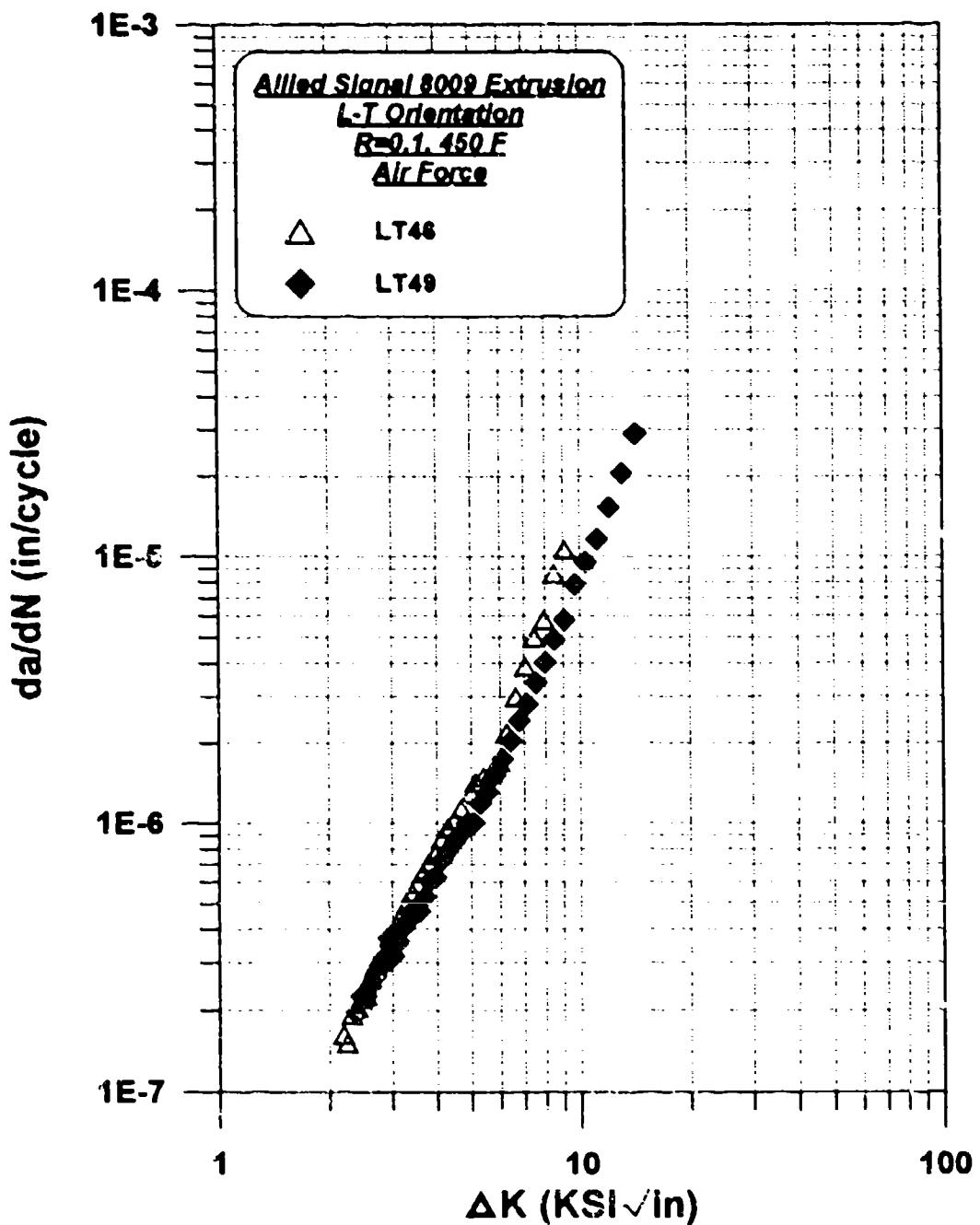


FIGURE B10. FATIGUE CRACK GROWTH RATE RESULTS FOR 8009 EXTRUSION (L-T ORIENTATION, 450 F, R=0.1) AIR FORCE.

Allied Signal 8009 Extrusion

R=0.1

L-T Orientation

Air Force

450 F

Specimen # LT46

Delta K da/dN

2.19	1.63E-07
2.24	1.51E-07
2.31	1.92E-07
2.39	2.04E-07
2.45	2.22E-07
2.53	2.27E-07
2.6	2.65E-07
2.69	2.95E-07
2.79	3.03E-07
2.97	3.70E-07
2.96	3.76E-07
3.07	4.15E-07
3.17	4.50E-07
3.28	4.93E-07
3.4	5.47E-07
3.52	5.91E-07
3.65	6.46E-07
3.79	7.05E-07
3.95	7.61E-07
4.12	8.71E-07
4.29	9.57E-07
4.47	1.03E-06
4.67	1.13E-06
4.99	1.29E-06
5.12	1.43E-06
5.38	1.50E-06
5.66	1.55E-06
5.95	1.71E-06
6.27	2.20E-06
6.63	2.99E-06
7.04	3.87E-06
7.46	4.97E-06
7.95	5.79E-06
8.48	8.59E-06
9.07	1.06E-05

Specimen # LT49

Delta K da/dN

2.37	1.95E-07
2.45	2.20E-07
2.53	2.26E-07
2.6	2.45E-07
2.68	2.67E-07
2.76	2.92E-07
2.84	3.13E-07
2.93	3.70E-07
3.02	3.17E-07
3.12	3.60E-07
3.22	4.05E-07
3.33	4.32E-07
3.45	4.76E-07
3.57	4.66E-07
3.7	5.28E-07
3.84	6.13E-07
3.97	6.26E-07
4.13	7.27E-07
4.29	7.80E-07
4.46	8.44E-07
4.64	9.09E-07
4.84	9.95E-07
5.06	1.00E-06
5.29	1.19E-06
5.54	1.31E-06
5.8	1.52E-06
6.1	1.74E-06
6.43	2.04E-06
6.77	2.43E-06
7.14	2.82E-06
7.55	3.38E-06
7.99	4.02E-06
8.49	4.88E-06
9.06	5.79E-06
9.69	7.85E-06
10.41	9.49E-06
11.2	1.11E-05
12.09	1.53E-05
13.12	2.09E-05
14.3	2.91E-05

**TABLE B51. FATIGUE CRACK GROWTH RATE RESULTS FOR 8009 EXTRUSION
(L-T ORIENTATION, 450 F, R=0.1) AIR FORCE**

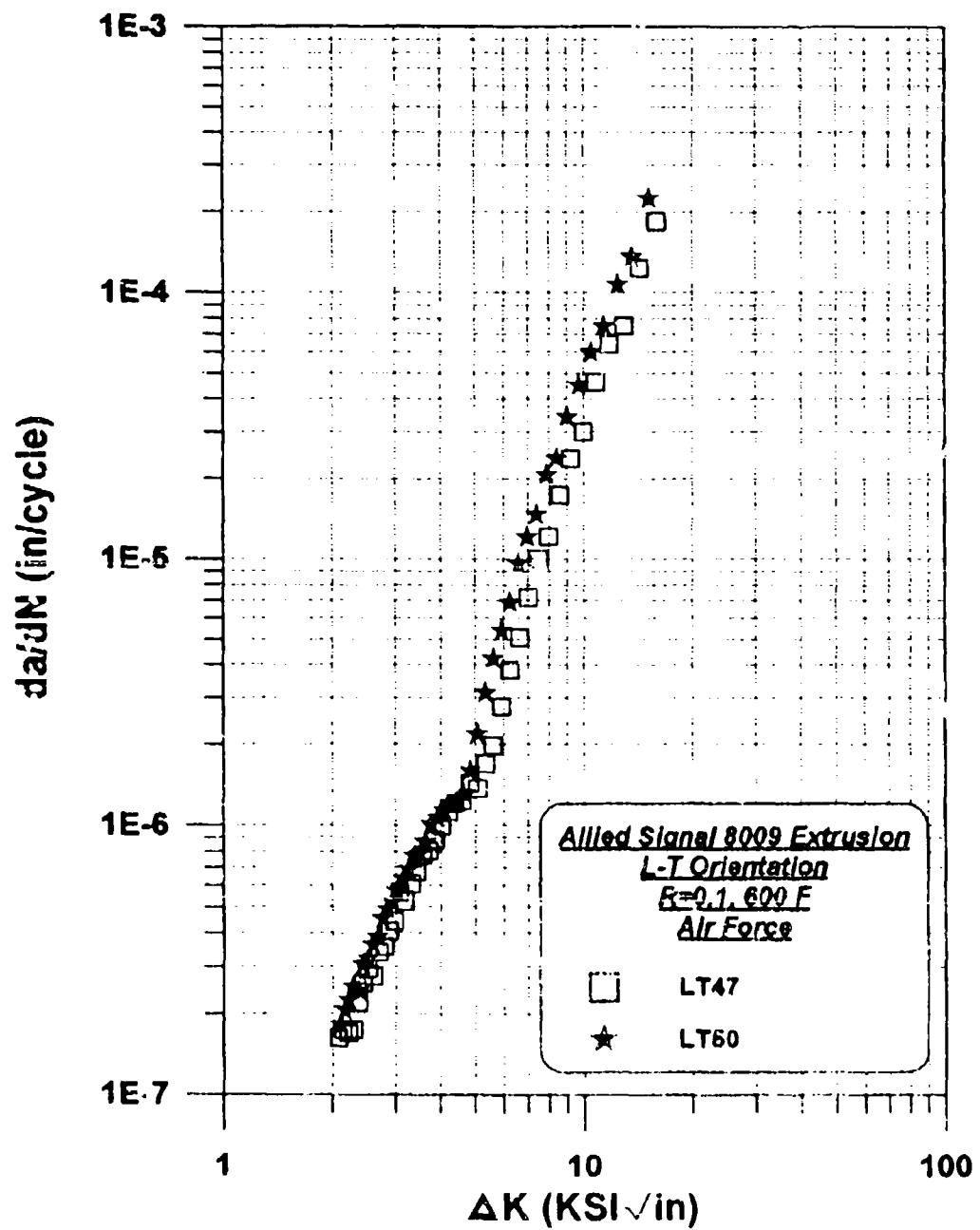


FIGURE B11. FATIGUE CRACK GROWTH RATE RESULTS FOR 8009 EXTRUSION
(L-T ORIENTATION, 600 F, $E=0.1$) AIR FORCE.

Allied Signal 8009 Extrusion
 R=0.1
 L-T Orientation
 Air Force
 600 F

Specimen # LT47		Specimen # LT50	
Delta K	da/dN	Delta K	da/dN
2.09	1.63E-07	2.11	1.81E-07
2.15	1.75E-07	2.16	2.07E-07
2.22	1.70E-07	2.22	2.25E-07
2.29	1.74E-07	2.29	2.54E-07
2.36	2.21E-07	2.36	2.44E-07
2.43	2.61E-07	2.43	3.06E-07
2.51	2.94E-07	2.51	3.20E-07
2.6	2.78E-07	2.58	3.63E-07
2.69	3.40E-07	2.67	3.87E-07
2.78	3.56E-07	2.75	4.51E-07
2.87	4.05E-07	2.84	4.88E-07
2.97	4.41E-07	2.93	5.21E-07
3.08	5.64E-07	3.03	5.70E-07
3.19	5.23E-07	3.14	6.31E-07
3.31	6.05E-07	3.25	6.83E-07
3.43	6.69E-07	3.37	7.68E-07
3.56	7.75E-07	3.5	7.65E-07
3.7	8.04E-07	3.63	8.59E-07
3.86	8.79E-07	3.76	1.01E-06
4.02	9.96E-07	3.92	1.06E-06
4.2	1.12E-06	4.08	1.14E-06
4.4	1.21E-06	4.25	1.20E-06
4.6	1.23E-06	4.43	1.21E-06
4.82	1.43E-06	4.63	1.32E-06
5.06	1.37E-06	4.84	1.59E-06
5.33	1.69E-06	5.07	2.18E-06
5.61	1.98E-06	5.32	3.12E-06
5.91	2.78E-06	5.5	4.21E-06
6.26	3.81E-06	5.9	5.39E-06
6.63	5.07E-06	6.23	6.86E-06
7.03	7.17E-06	6.58	0.59E-06
7.51	1.00E-05	6.97	1.21E-05
8.02	1.22E-05	7.39	1.47E-05
8.6	1.74E-05	7.88	2.07E-05
9.24	2.38E-05	8.42	2.39E-05
9.96	3.01E-05	9	3.42E-05
10.79	4.62E-05	9.69	4.51E-05
11.76	6.41E-05	10.47	5.97E-05
12.93	7.51E-05	11.35	7.49E-05
14.28	1.23E-04	12.4	1.07E-04
15.08	1.93E-04	13.63	1.35E-04
		15.21	2.24E-04

TABLE B52. FATIGUE CRACK GROWTH RATE RESULTS FOR 8009 EXTRUSION
 (L-T ORIENTATION, 600 F, R=0.1) AIR FORCE.

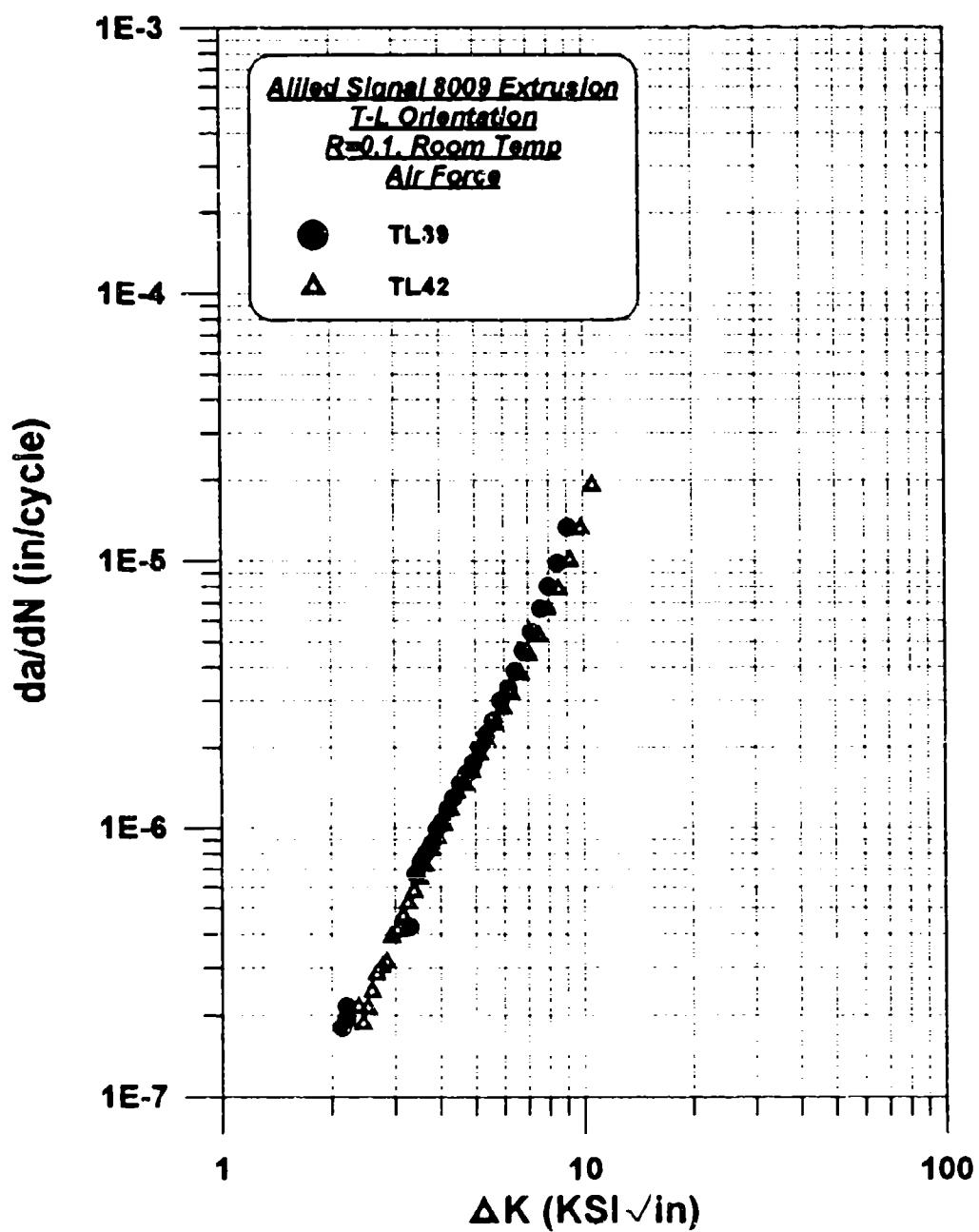


FIGURE B12. FATIGUE GROWTH RATE RESULTS FOR 8009 EXTRUSION
(T-L ORIENTATION, ROOM TEMPERATURE, R=0.1) AIR FORCE

Allied Signal 8009 Extrusion

R=0.1

T-L Orientation

Air Force

Room Temperature

Specimen # TL39

Delta K	da/dN
2.14	1.81E-07
2.2	1.95E-07
2.2	2.17E-07
3.24	4.26E-07
3.29	4.26E-07
3.41	6.70E-07
3.52	7.37E-07
3.65	8.05E-07
3.78	8.70E-07
3.91	9.89E-07
4.05	1.05E-06
4.19	1.17E-06
4.35	1.30E-06
4.54	1.46E-06
4.72	1.59E-06
4.93	1.76E-06
5.13	2.02E-06
5.35	2.24E-06
5.6	2.52E-06
5.87	3.00E-06
6.17	3.34E-06
6.45	3.88E-06
6.79	4.61E-06
7.16	5.44E-06
7.6	6.63E-06
8.02	8.01E-06
8.5	9.80E-06
9.05	1.33E-05

Specimen # TL42

Delta K	da/dN
2.36	2.15E-07
2.43	1.85E-07
2.51	2.13E-07
2.58	2.44E-07
2.66	2.84E-07
2.75	3.01E-07
2.84	3.15E-07
2.93	3.90E-07
3.04	4.10E-07
3.15	4.65E-07
3.25	5.20E-07
3.38	5.73E-07
3.5	6.43E-07
3.63	7.18E-07
3.77	8.17E-07
3.93	9.11E-07
4.08	1.03E-06
4.27	1.17E-06
4.45	1.35E-06
4.67	1.46E-06
4.89	1.62E-06
5.14	1.88E-06
5.39	2.11E-06
5.67	2.43E-06
5.98	2.81E-06
6.31	3.17E-06
6.68	3.78E-06
7.06	4.44E-06
7.53	5.25E-06
8.02	6.58E-06
8.56	7.83E-06
9.19	1.00E-05
9.86	1.31E-05
10.61	1.91E-05

**TABLE B53. FATIGUE CRACK GROWTH RATE RESULTS FOR 8009 EXTRUSION
(T-L ORIENTATION, ROOM TEMPERATURE, R=0.1) AIR FORCE.**

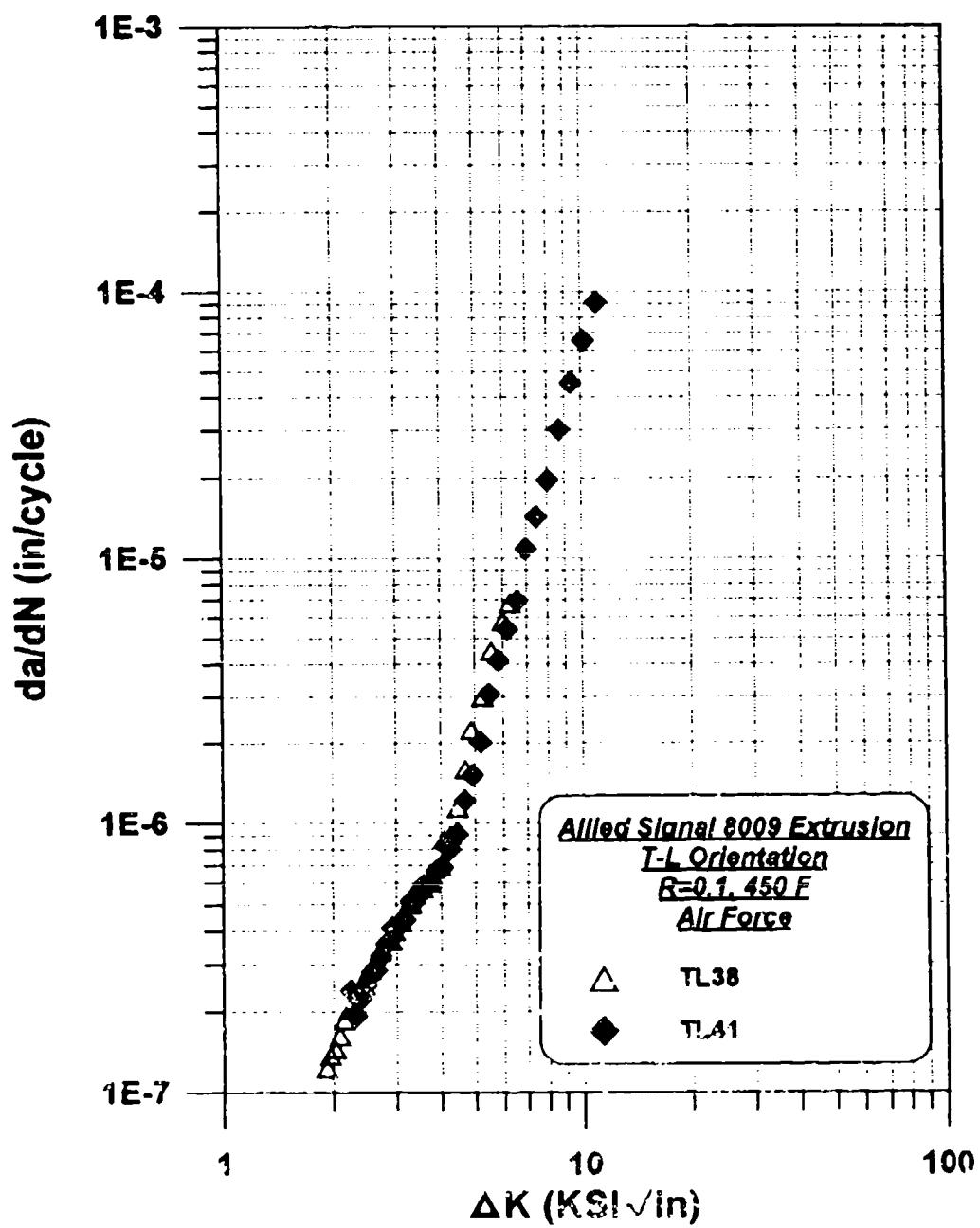


FIGURE B13. FATIGUE CRACK GROWTH RATE RESULTS FOR 8009 EXTRUSION
(T-L ORIENTATION, 450 F, R=0.1) AIR FORCE.

Allied Signal 8009 Extrusion

R=0.1

T-L Orientation

Air Force

450 F

Specimen # TL38

Delta K	da/dN
1.91	1.23E-07
1.96	1.37E-07
2.02	1.46E-07
2.08	1.62E-07
2.15	1.86E-07
2.21	2.05E-07
2.29	2.10E-07
2.36	2.45E-07
2.44	2.53E-07
2.52	2.87E-07
2.61	3.09E-07
2.7	3.36E-07
2.9	3.68E-07
2.95	3.98E-07
3.08	4.33E-07
3.14	4.70E-07
3.28	5.04E-07
3.39	5.64E-07
3.54	5.72E-07
3.71	6.05E-07
3.97	6.96E-07
4.08	8.70E-07
4.25	9.05E-07
4.47	1.14E-06
4.7	1.59E-06
4.88	2.24E-06
5.24	3.00E-06
5.55	4.48E-06
6	5.80E-06
6.28	6.80E-06

Specimen # TL41

Delta K	da/dN
2.24	2.41E-07
2.31	1.93E-07
2.38	2.24E-07
2.46	2.51E-07
2.55	2.81E-07
2.63	2.85E-07
2.71	3.23E-07
2.81	3.57E-07
2.92	4.10E-07
3.03	4.15E-07
3.16	4.39E-07
3.29	5.13E-07
3.41	5.23E-07
3.56	5.88E-07
3.7	5.97E-07
3.87	6.62E-07
4.05	6.85E-07
4.23	7.99E-07
4.45	9.11E-07
4.68	1.21E-06
4.92	1.51E-06
5.19	2.01E-06
5.48	3.09E-06
5.81	4.13E-06
6.16	5.43E-06
6.57	6.91E-06
6.98	1.08E-05
7.48	1.43E-05
8.03	1.96E-05
8.66	3.02E-05
9.38	4.53E-05
10.15	6.53E-05
11.03	9.11E-05

**TABLE B54. FATIGUE CRACK GROWTH RATE RESULTS FOR 8009 EXTRUSION
(T-L ORIENTATION, 450 F, R=0.1) AIR FORCE**

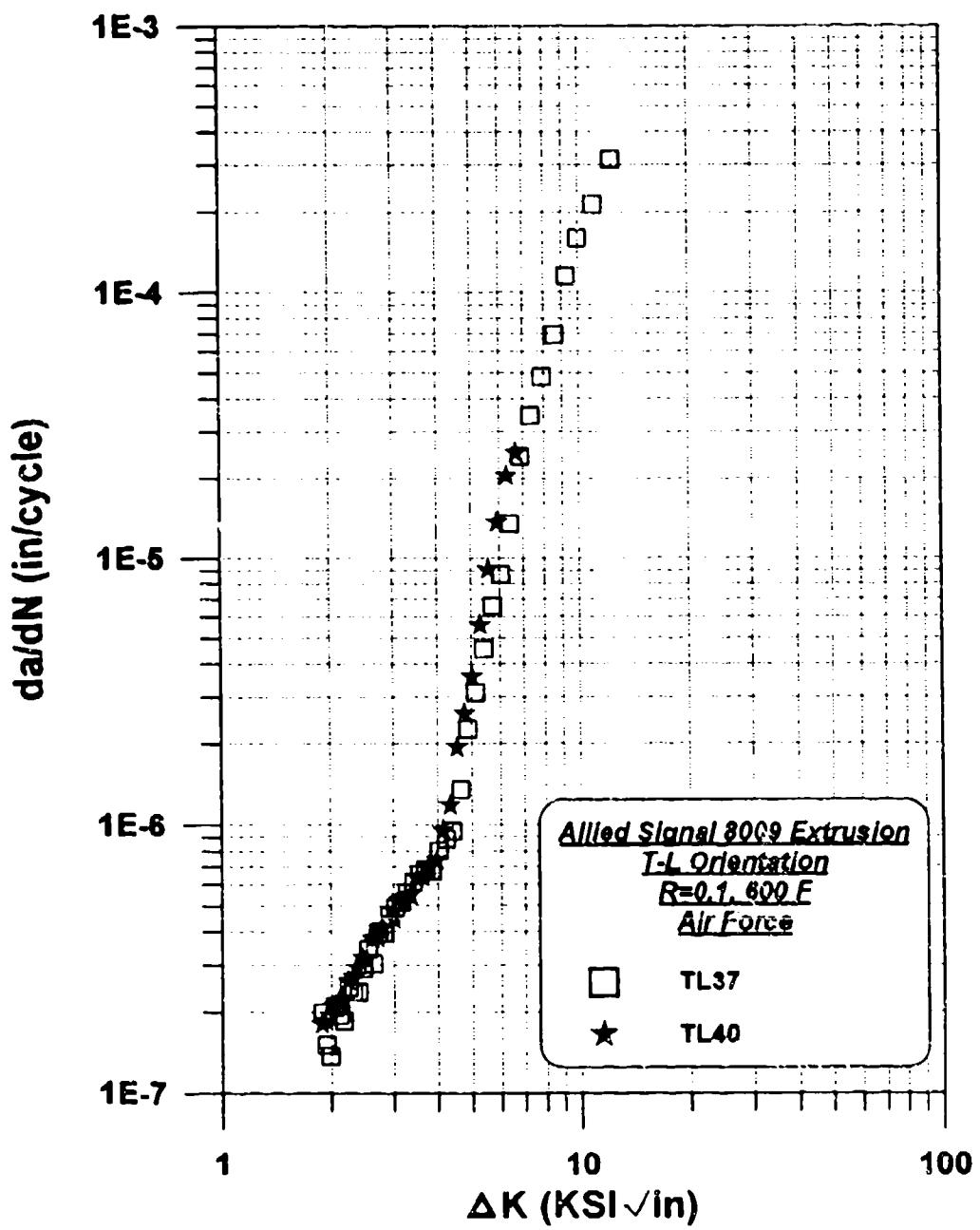


FIGURE B14. FATIGUE CRACK GROWTH RATE RESULTS FOR 8009 EXTRUSION
(T-L ORIENTATION, 600 F, R=0.1) AIR FORCE.

Allied Signal 8009 Extrusion

R=0.1

T-L Orientation

Air Force

600 F

Specimen # TL37

Delta K	da/dN
1.89	2.00E-07
1.94	1.51E-07
1.99	1.37E-07
2.05	2.09E-07
2.11	1.95E-07
2.17	1.86E-07
2.24	2.48E-07
2.31	2.39E-07
2.39	2.39E-07
2.46	2.91E-07
2.54	3.45E-07
2.63	3.04E-07
2.71	3.97E-07
2.81	3.96E-07
2.92	4.59E-07
3.03	4.90E-07
3.14	5.14E-07
3.26	5.56E-07
3.41	6.13E-07
3.54	6.55E-07
3.69	6.81E-07
3.86	6.71E-07
4.02	8.00E-07
4.21	8.93E-07
4.41	9.45E-07
4.63	1.35E-06
4.87	2.28E-06
5.12	3.13E-06
5.42	4.55E-06
5.73	6.58E-06
6.06	8.69E-06
6.42	1.35E-05
6.85	2.42E-05
7.34	3.46E-05
7.92	4.81E-05
8.57	6.92E-05
9.26	1.15E-04
9.98	1.60E-04
11	2.13E-04
12.35	3.16E-04

Specimen # TL40

Delta K	da/dN
1.88	1.81E-07
1.93	1.86E-07
1.99	1.95E-07
2.04	2.12E-07
2.1	2.20E-07
2.17	2.23E-07
2.23	2.62E-07
2.3	2.71E-07
2.37	2.92E-07
2.45	3.20E-07
2.52	3.14E-07
2.61	3.78E-07
2.7	3.79E-07
2.78	4.20E-07
2.99	4.46E-07
2.99	4.80E-07
3.1	5.26E-07
3.22	5.22E-07
3.35	5.46E-07
3.49	6.35E-07
3.62	6.39E-07
3.79	7.08E-07
3.96	7.41E-07
4.13	9.50E-07
4.34	1.18E-06
4.53	1.94E-06
4.76	2.60E-06
5.01	3.58E-06
5.29	5.58E-06
5.58	9.10E-06
5.91	1.37E-05
6.28	2.05E-05
6.67	2.51E-05

TABLE B55. FATIGUE CRACK GROWTH RATE RESULTS FOR 8009 EXTRUSION
(T-L ORIENTATION, 600 F, R=0.1) AIR FORCE.

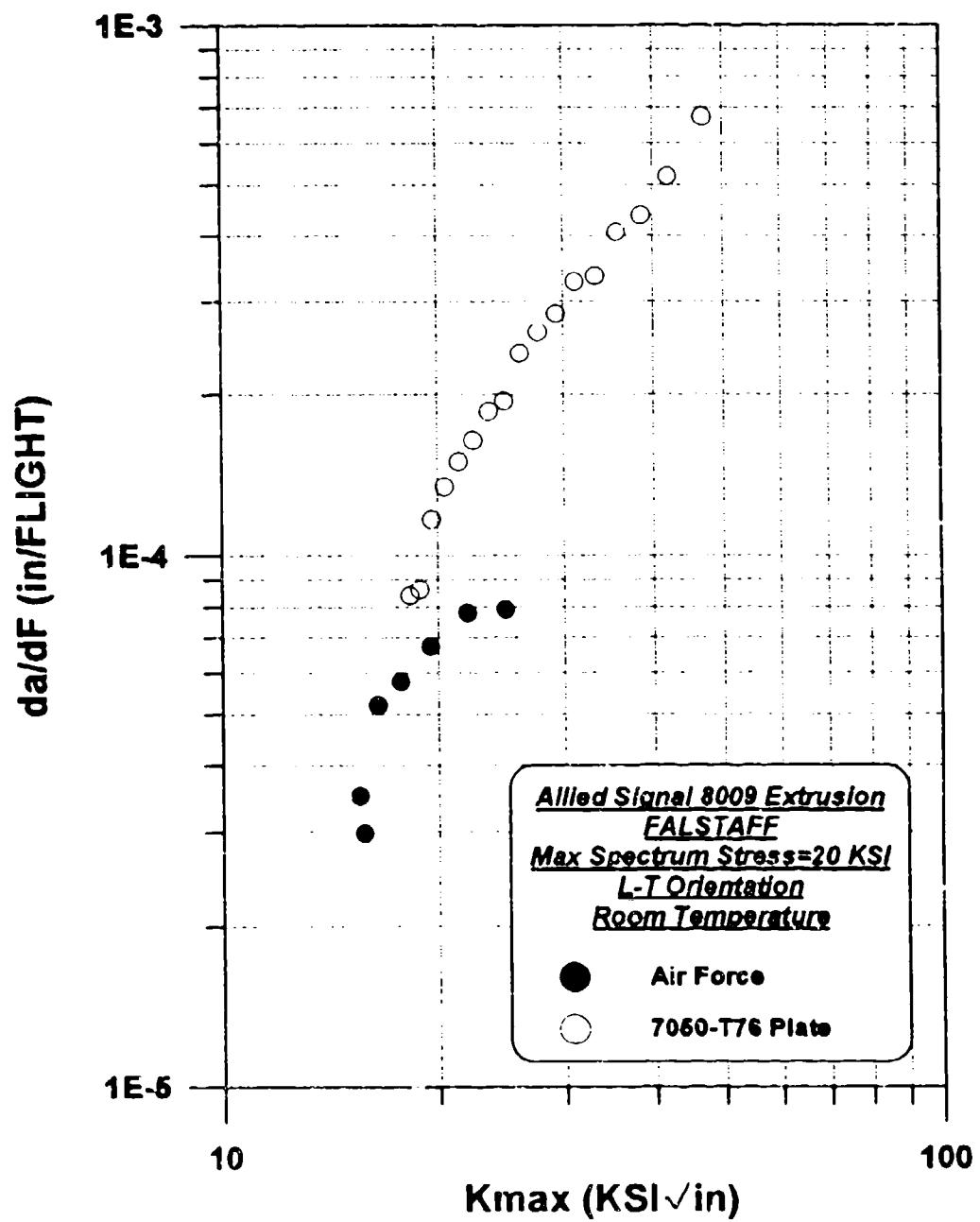


FIGURE B15. COMPARISON OF 8009 EXTRUSION AND 7050 PLATE FALSTAFF SPECTRUM FATIGUE CRACK GROWTH RATE DATA (L-T ORIENTATION) AIR FORCE.

SPECTRUM DATA REDUCTION

DATE:
 TITLE: Room Temp
 SPECIMEN NUMBER: CC-43
 MATERIAL TYPE: 8009
 ORIENTATION: L-T
 SPECTRUM TYPE: FALSTAFF
 SPECIMEN THICKNESS= 0.2512 IN.
 SPECIMEN WIDTH= 4.002 IN.
 P_{max}= 20000 LBS

TOTAL FLIGHTS	CRACK LENGTH	da/dF	K MAX
1	0.3773		
200	0.3843	3.51E-05	15.47
600	0.4022	2.99E-05	15.73
1000	0.4542	5.20E-05	16.43
1400	0.5349	5.77E-05	17.70
1800	0.6561	6.74E-05	19.51
2200	0.8275	7.79E-05	21.94
2400	1.0179	7.94E-05	24.77

TABLE B56. FALSTAFF SPECTRUM FATIGUE CRACK GROWTH RATE RESULTS FOR 8009 EXTRUSION
(L-T ORIENTATION) AIR FORCE.

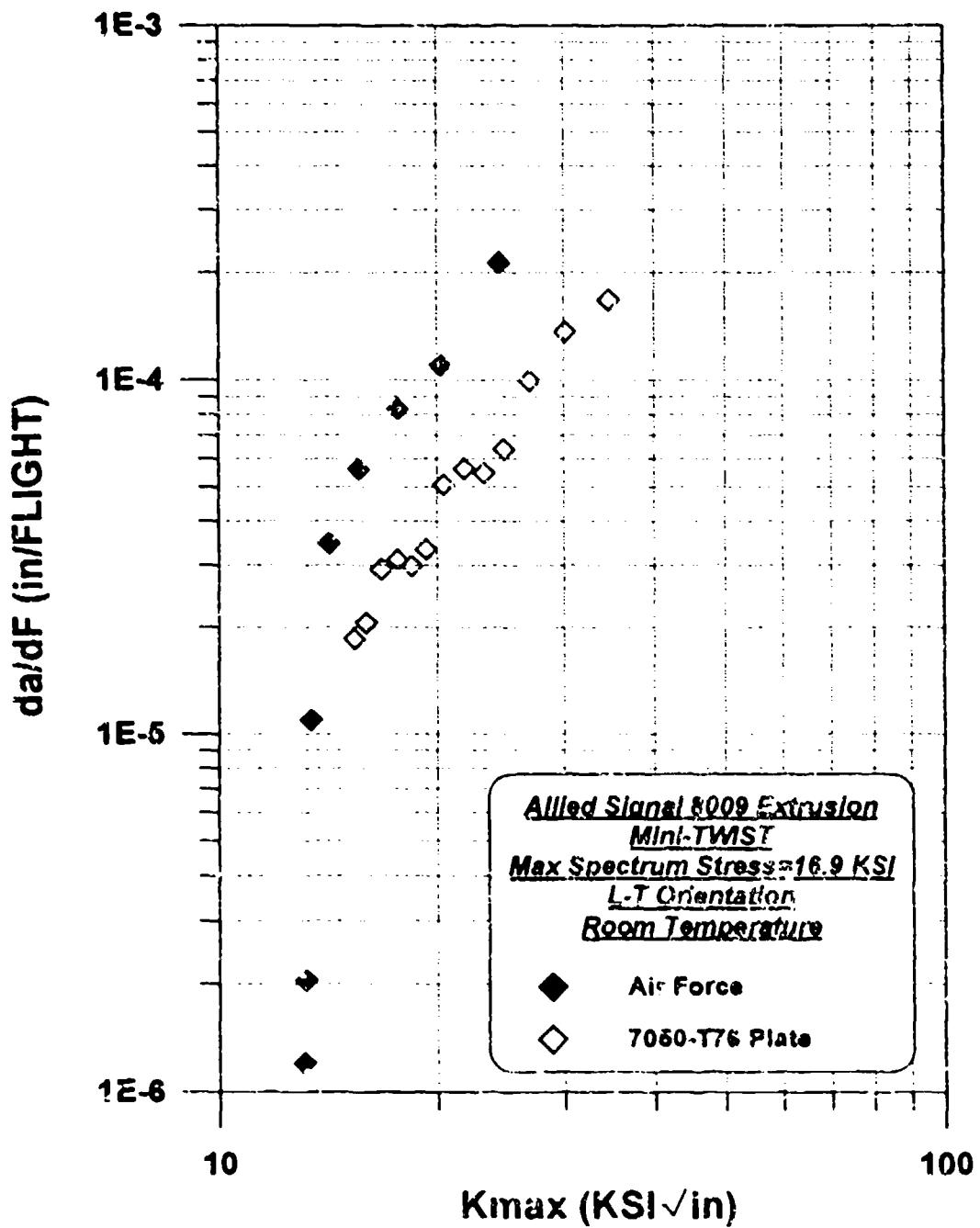


FIGURE B16. COMPARISON OF 8009 EXTRUSION AND 7050 PLATE MINI-TWIST SPECTRUM FATIGUE CRACK GROWTH RATE DATA (L-T ORIENTATION) AIR FORCE.

SPECTRUM DATA REDUCTION

DATE:
 TITLE: Room Temp
 SPECIMEN NUMBER: CC-44
 MATERIAL TYPE: 8009
 ORIENTATION: L-T
 SPECTRUM TYPE: Mini-TWIST
 SPECIMEN THICKNESS= 0.2438 IN.
 SPECIMEN WIDTH= 4.002 IN.
 P_{max}= 16489 LBS

TOTAL FLIGHTS	CRACK LENGTH	da/dF	K MAX
1	0.3777		
2000	0.3801	1.20E-06	13.11
4000	0.3842	2.05E-06	13.17
6000	0.4061	1.10E-05	13.40
8000	0.4753	3.46E-05	14.17
10000	0.5873	5.60E-05	15.61
12000	0.7529	8.29E-05	17.64
14000	0.9733	1.10E-04	20.26
16000	1.3997	2.13E-04	24.41

TABLE B57. MINI-TWIST SPECTRUM FATIGUE CRACK GROWTH RATE RESULTS FOR 8009 EXTRUSION
(L-T ORIENTATION) AIR FORCE.

APPENDiX C

CZ42 SHEET
0.09" X 12" X 48"

TABLE C1
TENSILE RESULTS FOR
ALCOA CZ42 SHEET (0.090" THICK)

COMPANY	TEST TEMP	ORIENT- ATION	ULTIMATE STRENGTH	YIELD STRENGTH	ELONG (%)	RA (%)	E (MSI)
	(DEGREES F)		(KSI)	(KSI)			
GENERAL DYNAMICS, CA	RT	LONG	70.6 70.4 70.6	66.0 65.5 64.7	7.5 8.0 8.0		10.8 10.2 10.3
		AVERAGE	70.5	65.4	7.8		10.4
		STANDARD DEVIATION	0.1	0.7	0.3		0.3

TABLE C2
TENSILE RESULTS FOR
ALCOA CZ42 SHEET (0.090" THICK)

COMPANY	TEST TEMP	ORIENT- ATION	ULTIMATE STRENGTH	YIELD STRENGTH	ELONG (%)	RA (%)	E (MSI)
	(DEGREES F)		(KSI)	(KSI)			
GENERAL DYNAMICS, CA	RT	L TRANS	68.3 67.9 68.3	60.9 59.1 59.3	10.0 10.0 10.0		10.6 10.6 10.6
		AVERAGE	68.2	59.8	10.0		10.6
		STANDARD DEVIATION	0.2	1.0	0.0		0.0

TABLE C3
TENSILE RESULTS FOR
ALCOA CZ42 SHEET (0.090" THICK)

COMPANY	TEST TEMP (DEGREES F)	ORIENT- ATION	ULTIMATE STRENGTH (KSI)	YIELD STRENGTH (KSI)	ELONG (%)	RA (%)	E (MSI)
GENERAL DYNAMICS, CA	450	LONG	43.6	40.7	7.0		9.5
			44.8	38.9	8.0		9.5
			43.6	38.2	9.0		8.7
		AVERAGE	44.0	39.3	8.0		9.2
		STANDARD DEVIATION	0.7	1.3	1.0		0.5

TABLE C4
TENSILE RESULTS FOR
ALCOA CZ42 SHEET (0.090" THICK)

COMPANY	TEST TEMP (DEGREES F)	ORIENT- ATION	ULTIMATE STRENGTH (KSI)	YIELD STRENGTH (KSI)	ELONG (%)	RA (%)	E (MSI)
GENERAL DYNAMICS, CA	450	L TRANS	43.4	35.5	9.0		9.2
			43.1	36.3	8.5		9.4
			43.4	35.3	8.0		9.0
		AVERAGE	43.3	35.7	8.5		9.2
		STANDARD DEVIATION	0.2	0.5	0.5		0.2

TABLE C5
TENSILE RESULTS FOR
ALCOA CZ42 SHEET (0.090" THICK)

COMPANY	TEST TEMP (DEGREES F)	ORIENT- ATION	ULTIMATE STRENGTH (KSI)	YIELD STRENGTH (KSI)	ELONG (%)	RA (%)	E (MSI)
GENERAL DYNAMICS, CA	600	LONG	24.6	17.9	13.0		9.1
			24.6	18.8	12.0		9.6
			25.2	20.7	14.0		9.7
		AVERAGE	24.8	19.1	13.0		9.5
		STANDARD DEVIATION	0.3	1.4	1.0		0.3

TABLE C6
TENSILE RESULTS FOR
ALCOA CZ42 SHEET (0.090" THICK)

COMPANY	TEST TEMP (DEGREES F)	ORIENT- ATION	ULTIMATE STRENGTH (KSI)	YIELD STRENGTH (KSI)	ELONG (%)	RA (%)	E (MSI)
GENERAL DYNAMICS, CA	600	L TRANS	25.3	18.5	9.5		8.8
			24.5	18.8	7.0		8.7
			24.2	18.7	9.5		8.6
		AVERAGE	24.7	18.7	8.7		8.7
		STANDARD DEVIATION	0.6	0.2	1.4		0.1

TABLE C7
TENSILE RESULTS FOR
ALCOA CZ42 SHEET (0.090" THICK)

COMPANY	TEST TEMP (DEGREES F)	ORIENT- ATION	ULTIMATE STRENGTH (KSI)	YIELD STRENGTH (KSI)	ELONG (%)	RA (%)	E (MSI)
GENERAL DYNAMICS, CA	-320	LONG	107.6	87.1	2.5		9.5
	-320	L TRANS	106.4	78.7	2.0		9.1

TABLE C8
COMPRESSION RESULTS FOR
ALCOA CZ42 SHEET (0.090" THICK)

COMPANY	TEST TEMPERATURE (DEGREES F)	ORIENTATION	COMPRESSIVE YIELD STRENGTH (KSI)	COMPRESSIVE MODULUS (MSI)
AIR FORCE	RT	LONG	45.1 48.1	
		AVERAGE	46.6	
		STANDARD DEVIATION	2.2	

TABLE C9
COMPRESSION RESULTS FOR
ALCOA CZ42 SHEET (0.090" THICK)

COMPANY	TEST TEMPERATURE (DEGREES F)	ORIENTATION	COMPRESSIVE YIELD STRENGTH (KSI)	COMPRESSIVE MODULUS (MSI)
AIR FORCE	RT	L TRANS	60.6 59.4	
		AVERAGE	60.0	
		STANDARD DEVIATION	0.8	

TABLE C10

COMPRESSION RESULTS FOR
ALCOA CZ42 SHEET (0.090" THICK)

COMPANY	TEST TEMPERATURE (DEGREES F)	ORIENTATION	COMPRESSIVE YIELD STRENGTH (KSI)	COMPRESSIVE MODULUS (MSI)
AIR FORCE	450	LONG	36.2 36.6	
		AVERAGE	36.4	
		STANDARD DEVIATION	0.3	

TABLE C11

COMPRESSION RESULTS FOR
ALCOA CZ42 SHEET (0.090" THICK)

COMPANY	TEST TEMPERATURE (DEGREES F)	ORIENTATION	COMPRESSIVE YIELD STRENGTH (KSI)	COMPRESSIVE MODULUS (MSI)
AIR FORCE	RT	L TRANS	43.4 42.6	
		AVERAGE	43.0	
		STANDARD DEVIATION	0.6	

TABLE C12
COMPRESSION RESULTS FOR
ALCOA CZ42 SHEET (0.090" THICK)

COMPANY	TEST TEMPERATURE (DEGREES F)	ORIENTATION	COMPRESSIVE YIELD STRENGTH (KSI)	COMPRESSIVE MODULUS (MSI)
AIR FORCE	600	LONG	27.2 26.3	
		AVERAGE	26.7	
		STANDARD DEVIATION	0.6	

TABLE C13
COMPRESSION RESULTS FOR
ALCOA CZ42 SHEET (0.090" THICK)

COMPANY	TEST TEMPERATURE (DEGREES F)	ORIENTATION	COMPRESSIVE YIELD STRENGTH (KSI)	COMPRESSIVE MODULUS (MSI)
AIR FORCE	RT	L TRANS	33.3 33.8	
		AVERAGE	33.5	
		STANDARD DEVIATION	0.4	

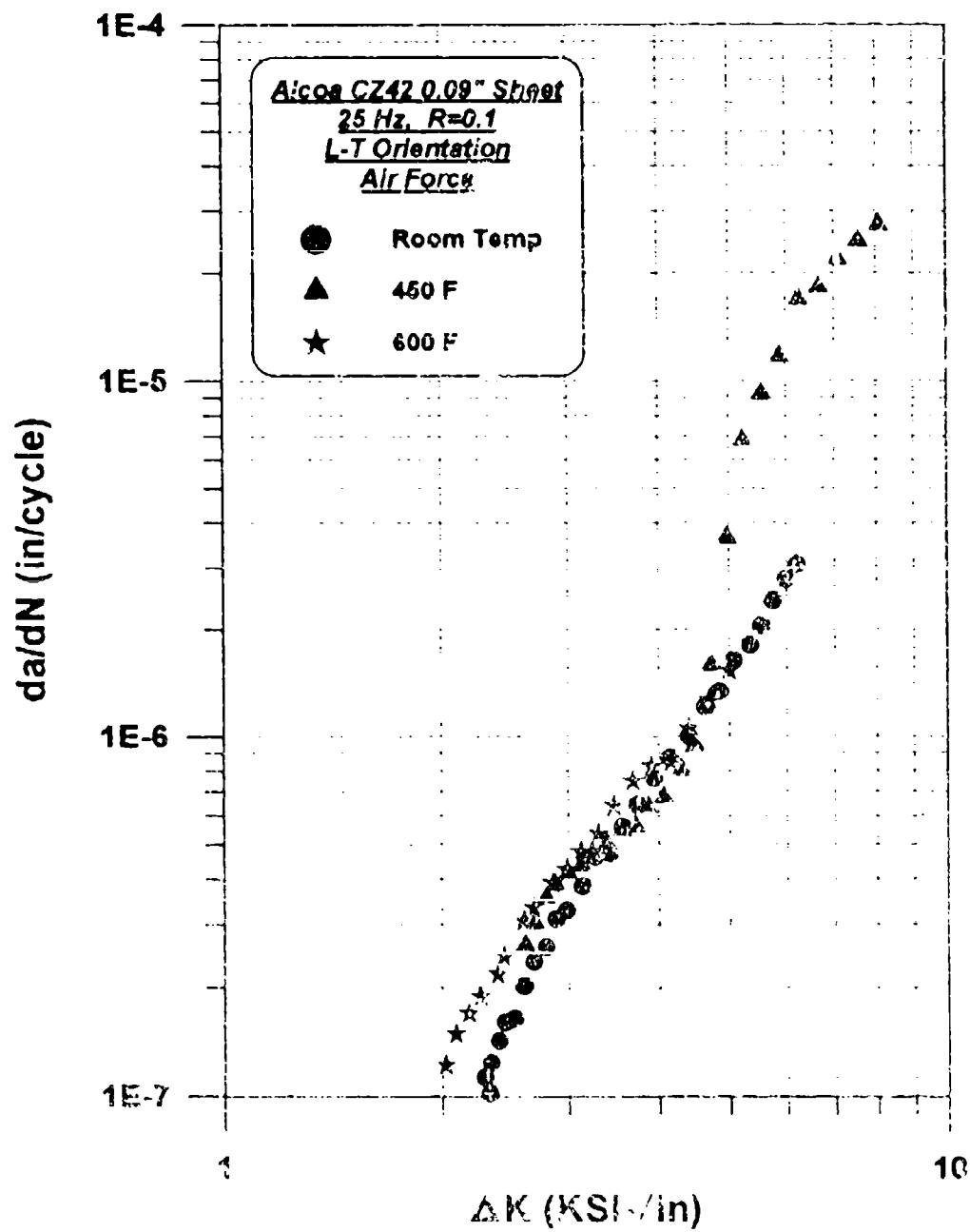


FIGURE C1. FATIGUE CRACK GROWTH RATE RESULTS OF CZ42 SHEET
(L-T ORIENTATION, ROOM TEMP, 450 F, AND 600 F) AIR FORCE

Alcoa CZ42 0.09" Sheet

25 Hz, R=0.1

L-T Orientation

Air Force

Nom Temperature		450 F		600 F	
Delta K	da/dN	Delta K	da/dN	Delta K	da/dN
2.23	1.02E-07	2.61	2.52E-07	2.02	1.22E-07
2.29	1.13E-07	2.69	3.02E-07	2.09	1.49E-07
2.34	1.24E-07	2.79	3.55E-07	2.18	1.70E-07
2.4	1.43E-07	2.88	3.86E-07	2.26	1.89E-07
2.45	1.61E-07	2.99	4.15E-07	2.39	2.18E-07
2.52	1.65E-07	3.12	4.35E-07	2.44	2.44E-07
2.6	2.03E-07	3.23	4.72E-07	2.6	3.06E-07
2.68	2.05E-07	3.39	5.01E-07	2.68	3.33E-07
2.73	2.59E-07	3.56	5.45E-07	2.35	3.89E-07
2.88	3.10E-07	3.71	5.60E-07	2.98	4.25E-07
2.96	2.27E-07	3.87	6.36E-07	3.12	4.75E-07
3.13	3.82E-07	4.06	6.73E-07	3.3	5.35E-07
3.26	4.60E-07	4.3	7.99E-07	3.47	6.38E-07
3.42	4.71E-07	4.49	9.45E-07	3.68	7.48E-07
3.56	5.59E-07	4.72	1.59E-06	3.91	8.22E-07
3.74	6.44E-07	4.97	3.62E-05	4.15	8.47E-07
3.94	7.61E-07	5.23	6.83E-06	4.4	1.05E-06
4.14	8.71E-07	5.56	9.19E-06	4.7	1.27E-06
4.39	1.30E-06	5.89	1.17E-05	5	1.53E-05
4.63	1.21E-06	6.26	1.70E-05		
4.84	1.34E-06	6.67	1.83E-05		
5.08	1.64E-06	7.09	2.20E-05		
5.35	1.81E-06	7.50	2.47E-05		
5.55	2.06E-06	8.08	2.74E-05		
5.76	2.42E-06				
5.93	2.78E-06				
6.21	3.00E-06				

TABLE C16. FATIGUE CRACK GROWTH RATE RESULTS CZ42 SHEET
(L-T ORIENTATION, HIGH TEMP, 450 F, AND 600 F) AIR FORCE.

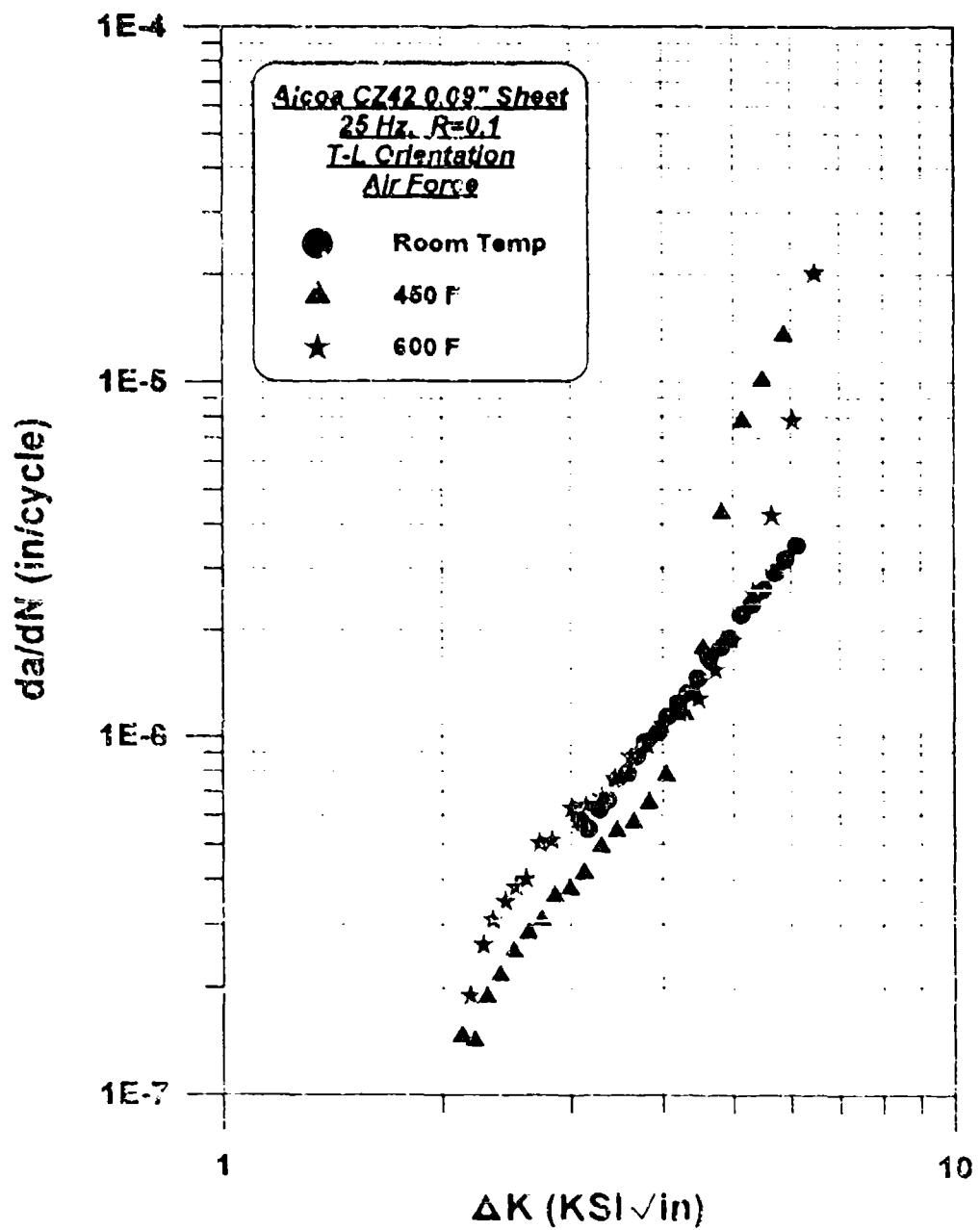


FIGURE C2. FATIGUE CRACK GROWTH RATE RESULTS FOR CZ42 SHEET
(T-L ORIENTATION, ROOM TEMP, 450 F, AND 600 F) AIR FORCE.

Alcoa CZ42 0.09" Sheet

25 Hz, R=0.1

T-L Orientation

Air Force

<i>Room Temperature</i>		<i>450 F</i>		<i>600 F</i>	
<i>Delta K</i>	<i>da/dN</i>	<i>Delta K</i>	<i>da/dN</i>	<i>Delta K</i>	<i>da/dN</i>
3.08	5.80E-07	2.123	1.46E-07	2.176	1.90E-07
3.16	5.52E-07	2.207	1.42E-07	2.268	2.63E-07
3.27	6.24E-07	2.295	1.88E-07	2.339	3.08E-07
3.358	6.63E-07	2.395	2.16E-07	2.435	3.46E-07
3.464	7.57E-07	2.495	2.51E-07	2.515	3.80E-07
3.576	7.87E-07	2.615	2.83E-07	2.595	4.01E-07
3.679	8.81E-07	2.725	3.08E-07	2.705	5.02E-07
3.787	9.66E-07	2.843	3.59E-07	2.819	5.12E-07
3.93	1.02E-06	2.984	3.75E-07	3.002	6.29E-07
4.049	1.13E-06	3.121	4.17E-07	3.132	6.43E-07
4.191	1.24E-06	3.285	4.91E-07	3.292	6.73E-07
4.324	1.33E-06	3.455	5.43E-07	3.437	7.61E-07
4.465	1.46E-06	3.647	5.73E-07	3.615	8.72E-07
4.629	1.57E-06	3.822	6.47E-07	3.806	9.44E-07
4.803	1.79E-06	4.042	7.75E-07	4.006	1.08E-06
4.951	1.90E-06	4.282	1.15E-06	4.216	1.16E-06
5.126	2.22E-06	4.548	1.78E-06	4.473	1.28E-06
5.312	2.38E-06	4.827	4.31E-06	4.722	1.54E-06
5.508	2.61E-06	5.152	7.77E-06	4.996	1.88E-06
5.697	2.92E-06	5.487	1.01E-05	5.323	2.57E-06
5.899	3.20E-06	5.875	1.35E-05	5.66	4.24E-06
6.113	3.50E-06			6.042	7.83E-06
				6.474	2.02E-05

TABLE C15. FATIGUE CRACK GROWTH RATE RESULTS FOR CZ42 SHEET
(T-L ORIENTATION, ROOM TEMP, 450 F, AND 600 F) AIR FORCE.

APPENDIX D

CZ42 EXTRUSION
1" X 3" X 72"

TABLE D1
TENSILE RESULTS FOR
ALCOA CZ42 EXTRUSION (1" X 3" X 72")

COMPANY	TEST TEMP	ORIENT- ATION	ULTIMATE STRENGTH (KSI)	YIELD STRENGTH (KSI)	ELONG (%)	RA (%)	E (MSI)
	(DEGREES F)						
AIR FORCE	RT	LONG	58.5	56.4	11.1	45.0	
			59.3	57.0	12.4	43.7	
			59.5	56.6	13.2	48.5	
		AVERAGE	59.1	56.7	12.2	45.7	
		STANDARD DEVIATION	0.5	0.0	1.1	2.5	

TABLE D2
TENSILE RESULTS FOR
ALCOA CZ42 EXTRUSION (1" X 3" X 72")

COMPANY	TEST TEMP	ORIENT- ATION	ULT MATE STRENGTH (KSI)	YIELD STPENGT (KSI)	ELONG (%)	RA (%)	E (MSI)
	(DEGREES F)						
AIR FORCE	RT	L. TRANS	55.3	48.8	13.5	42.5	
			55.9	48.0	12.3	39.9	
			56.4	49.8	10.8	45.8	
		AVERAGE	55.9	48.9	12.2	42.7	
		STANDARD DEVIATION	0.5	0.9	1.4	2.9	

TABLE D3
TENSILE RESULTS FOR
ALCOA CZ42 EXTRUSION (1" X 3" X 72")

COMPANY	TEST TEMP (DEGREES F)	ORIENT- ATION	ULTIMATE STRENGTH (KSI)	YIELD STRENGTH (KSI)	ELONG (%)	RA (%)	E (MSI)
AIR FORCE	450	LONG	39.6	37.5	9.2	20.7	
			40.0	37.7	6.9	25.9	
			39.6	36.7	8.7	21.7	
ARMY	450	LONG	41.5		2.8	16.0	
			44.0	38.5	5.4	16.0	
			45.0		7.5	12.0	
		AVERAGE	41.6	37.6	7.1	18.7	
		STANDARD DEVIATION	2.4	0.8	2.5	5.0	

TABLE D4
TENSILE RESULTS FOR
ALCOA CZ42 EXTRUSION (1" X 3" X 72")

COMPANY	TEST TEMP (DEGREES F)	ORIENT- ATION	ULTIMATE STRENGTH (KSI)	YIELD STRENGTH (KSI)	ELONG (%)	RA (%)	E (MSI)
AIR FORCE	450	L TRANS	39.0	36.5	9.4	15.9	
			38.8	34.6	6.5	17.7	
			38.1	35.1	9.2	20.9	
ARMY	450	L TRANS	44.4	40.5	7.5	15.6	
			42.5	37.5	3.1	12.0	
			42.6		4.7	12.0	
		AVERAGE	40.9	36.8	6.7	15.7	
		STANDARD DEVIATION	2.6	2.3	2.5	3.4	

TABLE D5
TENSILE RESULTS FOR
ALCOA C242 EXTRUSION (1" X 3" X 72")

COMPANY	TEST TEMP (DEGREES F)	ORIENT- ATION	ULTIMATE STRENGTH (KSI)	YIELD STRENGTH (KSI)	ELONG (%)	RA (%)	E (MSI)
AIR FORCE	600	LONG	26.5	24.3	15.6	24.8	
			25.9	24.1	15.7	23.1	
			26.8	25.3	13.6	23.8	
ARMY	600	LONG	29.2	26.8	4.1	16.0	8.1
			28.6	26.6	3.1	16.0	8.5
		AVERAGE	27.4	25.4	10.4	20.7	8.3
		STANDARD DEVIATION	1.4	1.3	6.3	4.4	0.3

TABLE D6
TENSILE RESULTS FOR
ALCOA C242 EXTRUSION (1" X 3" X 72")

COMPANY	TEST TEMP (DEGREES F)	ORIENT- ATION	ULTIMATE STRENGTH (KSI)	YIELD STRENGTH (KSI)	ELONG (%)	RA (%)	E (MSI)
AIR FORCE	600	L TRANS	26.5	24.4	14.0	24.9	
			25.6	23.5	14.7	16.1	
			25.3	25.2	15.0	19.5	
ARMY	600	L TRANS	27.7	24.4	2.7	14.0	8.7
			26.9	23.6	3.1	16.0	8.5
			28.6	25.6	2.6	10.0	8.0
		AVERAGE	26.9	24.5	8.7	16.7	8.4
		STANDARD DEVIATION	1.1	0.8	6.5	5.0	0.4

TABLE D7
COMPRESSION RESULTS FOR
ALCOA CZ42 EXTRUSION (1" X 3" X 72")

COMPANY	TEST TEMP (DEGREES F)	ORIENT-ATION	COMPRESSIVE YIELD STR. (KSI)	COMPRESSIVE MODULUS (MSI)
AIR FORCE	RT	LONG	51.0 59.4 60.1	
		AVERAGE	56.8	
		STANDARD DEVIATION	5.0	

TABLE D8
COMPRESSION RESULTS FOR
ALCOA CZ42 EXTRUSION (1" X 3" X 72")

COMPANY	TEST TEMP (DEGREES F)	ORIENT-ATION	COMPRESSIVE YIELD STR. (KSI)	COMPRESSIVE MODULUS (MSI)
AIR FORCE	RT	L TRANS	52.7 53.9	
		AVERAGE	53.3	
		STANDARD DEVIATION	0.8	

TABLE D9
 COMPRESSION RESULTS FOR
 ALCOA C242 EXTRUSION (1" X 3" X 72")

COMPANY	TEST TEMP (DEGREES F)	ORIENT-ATION	COMPRESSIVE YIELD STR. (KSI)	COMPRESSIVE MODULUS (MSI)
AIR FORCE	450	LONG	49.1 54.5	
		AVERAGE	51.8	
		STANDARD DEVIATION	3.8	

TABLE D10
 COMPRESSION RESULTS FOR
 ALCOA C242 EXTRUSION (1" X 3" X 72")

COMPANY	TEST TEMP (DEGREES F)	ORIENT-ATION	COMPRESSIVE YIELD STR. (KSI)	COMPRESSIVE MODULUS (MSI)
AIR FORCE	450	L TRANS	45.2 47.8	
		AVERAGE	46.5	
		STANDARD DEVIATION	1.8	

TABLE D11
COMPRESSION RESULTS FOR
ALCOA CZ42 EXTRUSION (1" X 3" X 72")

COMPANY	TEST TEMP (DEGREES F)	ORIENT-ATION	COMPRESSIVE YIELD STR. (KSI)	COMPRESSIVE MODULUS (MSI)
AIR FORCE	600	LONG	47.0 48.0	
		AVERAGE	47.5	
		STANDARD DEVIATION	0.7	

TABLE D12
COMPRESSION RESULTS FOR
ALCOA CZ42 EXTRUSION (1" X 3" X 72")

COMPANY	TEST TEMP (DEGREES F)	ORIENT-ATION	COMPRESSIVE YIELD STR. (KSI)	COMPRESSIVE MODULUS (MSI)
AIR FORCE	600	L TRANS	47.2 37.3 46.7	
		AVERAGE	43.7	
		STANDARD DEVIATION	5.6	

TABLE D13
FRACTURE TOUGHNESS RESULTS FOR
ALCOA CZ42 EXTRUSION (1" X 3" X 72")

COMPANY	TEST TEMP (DEG F)	ORIENTATION	KIC (KSI in ^{0.5})	Kq (KSI in ^{0.5})	COMMENT
ARMY	RT	L-T		27.7	(1)
AIR FORCE	RT	L-T	26.6 23.5	22.6	(2)
		AVERAGE	25.1	25.1	
		STANDARD DEVIATION	2.2	3.6	

(1): SPECIMEN DID NOT MEET THICKNESS CRITERIA OF ASTM E399
 (2): $P_{max}/P_q > 1.1$

TABLE D14
FRACTURE TOUGHNESS RESULTS FOR
ALCOA CZ42 EXTRUSION (1" X 3" X 72")

COMPANY	TEST TEMP (DEG F)	ORIENTATION	KIC (KSI in ^{0.5})	Kq (KSI in ^{0.5})	COMMENT
ARMY	RT	T-L	19.1	16.8	VALID (1)
AIR FORCE	RT	T-L	12.4 12.0 12.2		VALID VALID VALID
		AVERAGE	13.9	16.8	
		STANDARD DEVIATION	3.5		

(1): $P_{max}/P_q > 1.1$

TABLE D15
FATIGUE RESULTS WITH R=0.1 AND Kt=1.0 FOR
ALCOA CZ42 EXTRUSION (1" X 3" X 72")

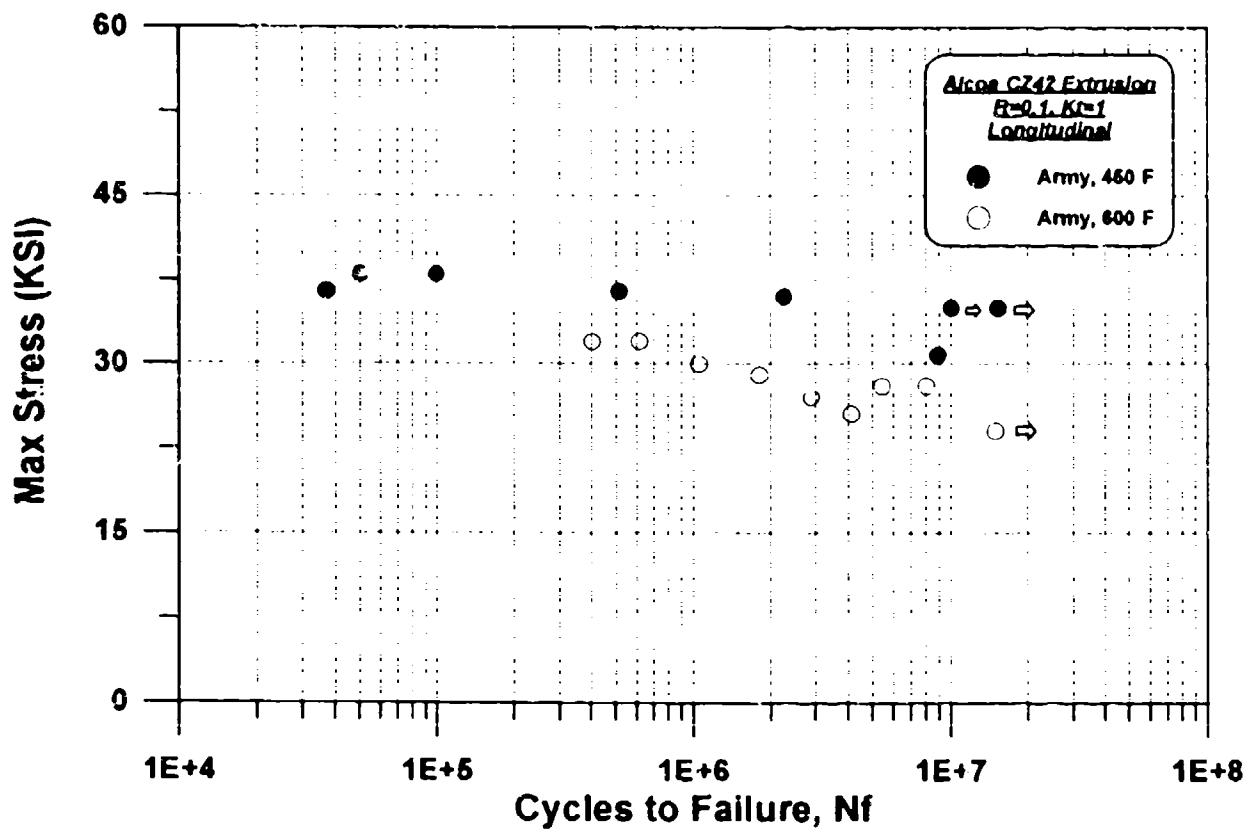
COMPANY	TEST TEMPERATURE (DEGREES F)	ORIENTATION	STRFSS (KSI)	CYCLES
ARMY	450	LONG	38.0	50,000
			38.0	99,000
			36.5	37,000
			36.5	512,000
			36.0	2,251,000
			35.0	15,308,000
			35.0	10,033,000
			30.8	8,655,000

(*): RUN OUT

TABLE D16
FATIGUE RESULTS WITH R=0.1 AND Kt=1.0 FOR
ALCOA CZ42 EXTRUSION (1" X 3" X 72")

COMPANY	TEST TEMPERATURE (DEGREES F)	ORIENTATION	STRESS (KSI)	CYCLES
ARMY	600	LONG	32.0	616,000
			32.0	403,000
			30.0	1,053,000
			29.0	1,811,000
			28.0	8,047,000
			28.0	5,425,000
			27.0	2,895,000
			25.5	4,099,000
			24.0	14,950,000
				*

(*): RUN OUT



**FIGURE D1. FATIGUE RESULTS FOR CZ42 EXTRUSION
(LONGITUDINAL ORIENTATION, 450 F AND 600 F) ARMY**

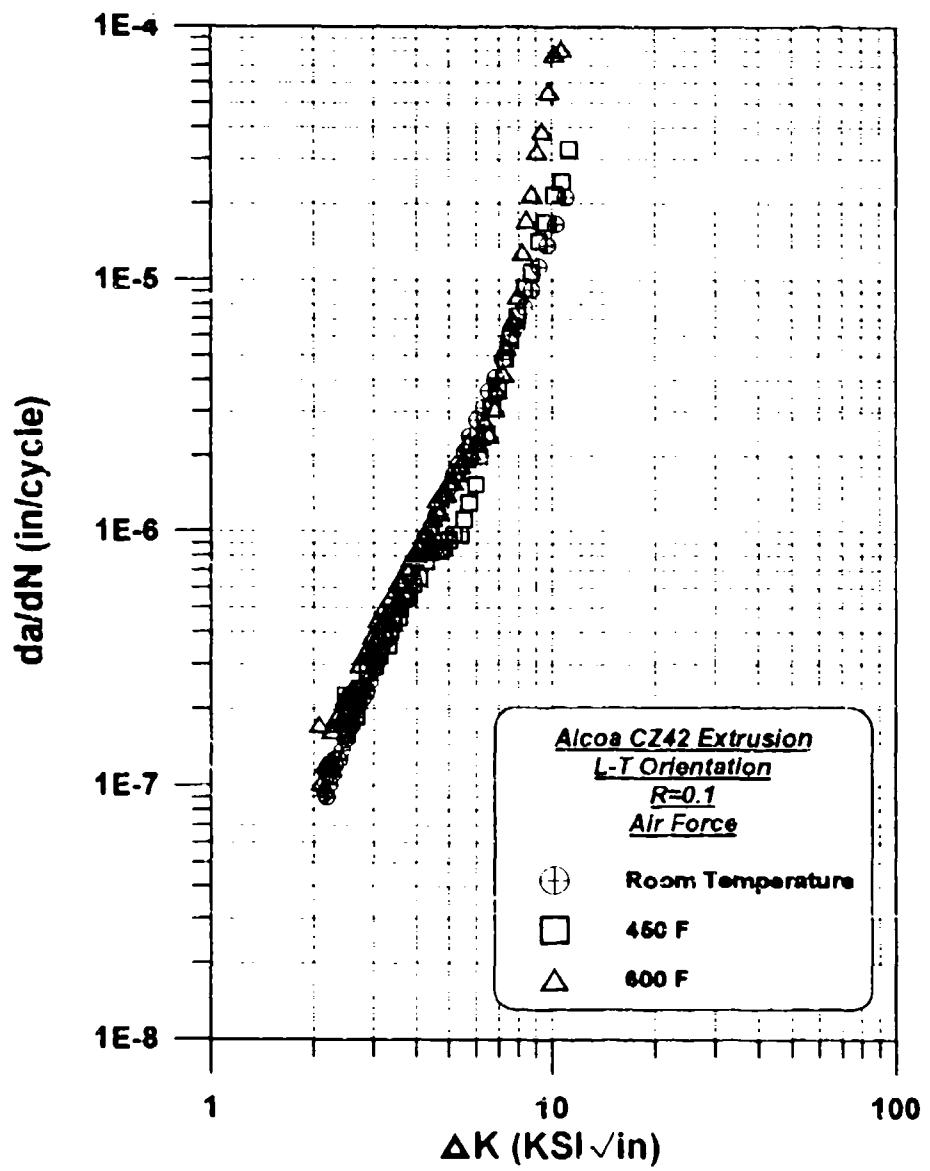


FIGURE D2. FATIGUE CRACK GROWTH RATE RESULTS FOR CZ42 EXTRUSION
(L-T ORIENTATION, ROOM TEMP, 450 F, AND 600 F) AIR FORCE.

Alcos CZ42 Extrusion

R-0.1

L-T Orientation

K Force

Room Temperature	450 F	800 F
Specimen # LT78	Specimen # LT77	Specimen # LT7
Delta K da/dN	Delta K da/dN	Delta K da/dN
2.16	2.48	2.08
2.19	2.49	2.1
2.23	2.57	2.16
2.28	2.67	2.21
2.32	2.69	2.25
2.38	2.64	2.26
2.42	2.7	2.27
2.48	2.76	2.34
2.53	2.89	2.37
2.59	2.99	2.38
2.65	3.05	2.41
2.72	3.14	2.47
2.79	3.24	2.49
2.86	3.34	2.55
2.93	3.38	2.58
3.01	3.45	2.59
3.09	3.57	2.63
3.18	3.6	2.71
3.26	3.71	2.74
3.36	3.81	2.8
3.45	3.94	2.84
3.55	4.09	2.89
3.65	4.29	2.94
3.77	4.42	2.97
3.89	4.54	3.02
4.01	4.71	3.07
4.16	4.84	3.13
4.29	4.99	3.18
4.44	5.17	3.25
4.52	5.39	3.26
4.77	5.53	3.37
4.96	5.74	3.43
5.18	6.01	3.48
5.35	6.17	3.57
5.56	6.45	3.65
5.78	6.7	3.79
6.29	7.3	3.87
6.55	7.6	3.96
6.86	7.92	4.04
7.17	8.31	4.08
7.53	8.73	4.21
7.89	9.2	4.31
8.3	9.62	4.4
8.75	10.19	4.5
9.21	10.74	4.6
9.74	11.25	4.71
10.31	11.25	4.8
10.94	11.25	4.93
		4.99
		5.16
		5.29
		5.43
		5.51
		5.71
		5.81
		6.04
		6.2
		6.38
		6.57
		6.78
		6.91
		7.2
		7.35
		7.65
		7.73
		8.19

TABLE D17. FATIGUE CRACK GROWTH RATE RESULTS FOR CZ42 EXTRUSION
(L-T ORIENTATION, ROOM TEMP, 450 F, AND 800 F) AIR FORCE.

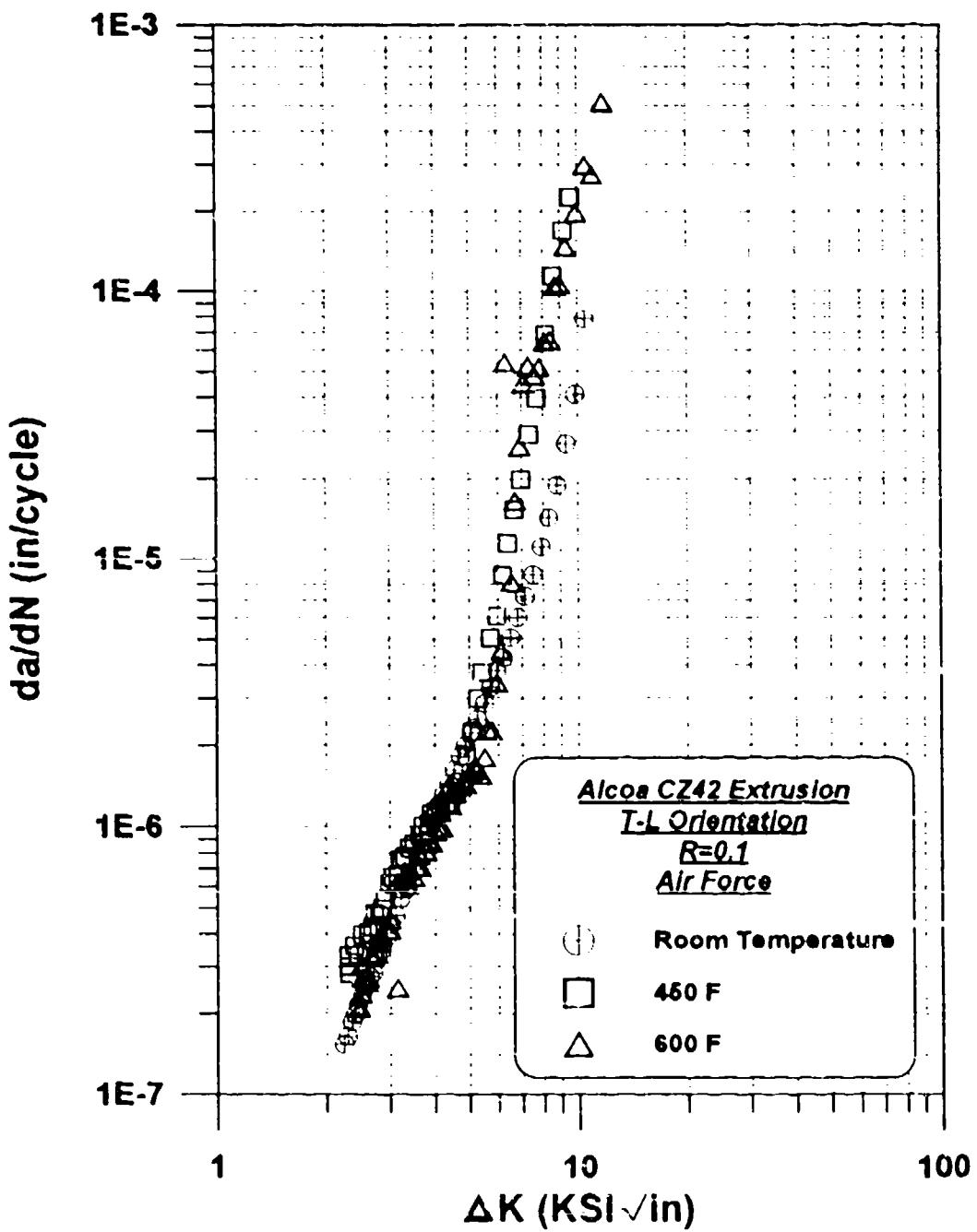


FIGURE D3. FATIGUE CRACK GROWTH RATE RESULTS FOR CZ42 EXTRUSION
(T-L ORIENTATION, ROOM TEMP, 450 F, AND 600 F) AIR FORCE

Room Temperature		450 F		600 F	
Specimen #	Delta K da/dN	Specimen #	Delta K da/dN	Specimen #	Delta K da/dN
2.23	1.54E-07	2.31	2.82E-07	2.46	2.10E-07
2.28	1.64E-07	2.3	3.32E-07	2.5	2.73E-07
2.34	1.86E-07	2.3	3.01E-07	2.49	2.37E-07
2.39	1.90E-07	2.38	3.59E-07	2.49	3.06E-07
2.44	2.18E-07	2.43	3.33E-07	2.59	2.61E-07
2.5	2.36E-07	2.5	3.96E-07	2.61	2.73E-07
2.56	2.56E-07	2.6	4.06E-07	2.65	3.30E-07
2.63	2.77E-07	2.67	4.22E-07	2.68	3.30E-07
2.69	2.85E-07	2.71	4.75E-07	2.76	3.71E-07
2.77	3.26E-07	2.79	4.70E-07	2.75	3.37E-07
2.84	3.48E-07	2.85	4.96E-07	2.81	3.88E-07
2.93	3.86E-07	2.91	5.37E-07	2.83	3.95E-07
3.01	4.33E-07	3	6.15E-07	2.98	4.13E-07
3.1	4.67E-07	3.05	6.51E-07	2.99	4.51E-07
3.2	5.40E-07	3.15	6.60E-07	3.12	6.18E-07
3.29	5.88E-07	3.21	7.56E-07	3.13	2.50E-07
3.37	6.54E-07	3.29	7.73E-07	3.2	5.95E-07
3.47	7.27E-07	3.39	8.32E-07	3.27	6.52E-07
3.58	7.93E-07	3.48	8.63E-07	3.31	6.46E-07
3.69	8.71E-07	3.61	9.30E-07	3.36	6.08E-07
3.81	9.62E-07	3.7	1.00E-06	3.41	6.87E-07
3.94	1.08E-06	3.84	1.02E-06	3.49	6.53E-07
4.06	1.20E-06	3.91	1.11E-06	3.54	7.09E-07
4.22	1.31E-06	4.02	1.13E-06	3.61	7.81E-07
4.36	1.44E-06	4.14	1.17E-06	3.64	7.04E-07
4.52	1.61E-06	4.3	1.21E-06	3.73	8.71E-07
4.69	1.82E-06	4.41	1.21E-06	3.78	8.12E-07
4.86	2.01E-06	4.57	1.31E-06	3.84	8.77E-07
5.05	2.22E-06	4.71	1.46E-06	3.91	8.74E-07
5.25	2.50E-06	4.9	1.82E-06	4.01	9.58E-07
5.49	2.87E-06	5.07	2.25E-06	4.08	8.85E-07
5.71	3.29E-06	5.26	2.98E-06	4.14	1.13E-06
5.95	3.80E-06	5.41	3.74E-06	4.18	9.87E-07
6.22	4.25E-06	5.71	5.03E-06	4.35	1.40E-06
6.51	5.07E-06	5.96	6.08E-06	4.43	1.20E-06
6.8	6.02E-06	6.2	8.69E-06	4.52	1.35E-06
7.14	7.21E-06	6.41	1.15E-05	4.57	1.33E-06
7.51	8.73E-06	6.69	1.53E-05	4.7	1.40E-06
7.9	1.11E-05	6.98	1.99E-05	4.79	1.46E-06
8.33	1.43E-05	7.32	2.91E-05	4.88	1.42E-06
8.77	1.89E-05	7.71	3.97E-05	5.01	1.59E-06
9.29	2.69E-05	8.17	6.84E-05	5.16	1.67E-06
9.83	4.10E-05	8.58	1.14E-04	5.22	1.62E-06
10.49	7.83E-05	9.17	1.69E-04	5.36	1.55E-06
		9.63	2.25E-04	5.5	1.80E-06
				5.61	2.28E-06
				5.75	2.27E-06
				5.96	3.43E-06
				6.13	4.52E-06
				6.31	5.40E-06
				6.54	8.13E-06
				6.71	1.66E-05
				6.91	2.63E-05
				7.08	4.51E-05
				7.31	5.22E-05
				7.58	4.81E-05
				7.84	5.18E-05
				8.11	6.44E-05
				8.43	6.50E-05
				8.69	1.05E-04
				8.94	1.06E-04
				9.32	1.47E-04
				9.91	1.97E-04
				10.52	2.93E-04
				11.02	2.74E-04
				11.78	5.13E-04

TABLE D18. FATIGUE CRACK GROWTH RATE RESULTS FOR CZ42 EXTRUSION
(T-L ORIENTATION, ROOM TEMP, 450 F, AND 600 F) AIR FORCE.

APPENDIX E

8019 EXTRUSION
1" X 3" X 72"

TABLE E1
 TENSILE RESULTS AT $t/2$ LOCATION FOR
 ALCOA CU78 (8019) EXTRUSION

COMPANY	TEST TEMP (DEGREES F)	ORIENT-ATION	ULTIMATE STRENGTH (KSI)	YIELD STRENGTH (KSI)	ELONG (%)	RA (%)	E (MSI)
AIR FORCE	RT	LONG	65.6	56.7	12.0	35.4	11.7
			65.8	56.9	11.3	35.6	10.6
			67.1	58.4	11.2	35.9	11.4
		AVERAGE	66.8	57.3	11.5	35.6	11.2
		STANDARD DEVIATION	0.3	0.9	0.4	0.3	0.6

TABLE E2
 TENSILE RESULTS AT $t/2$ LOCATION FOR
 ALCOA CU78 (8019) EXTRUSION

COMPANY	TEST TEMP (DEGREES F)	ORIENT-ATION	ULTIMATE STRENGTH (KSI)	YIELD STRENGTH (KSI)	ELONG (%)	RA (%)	E (MSI)
AIR FORCE	RT	L TRANS	65.0		10.9	35.2	9.9
			65.8	54.6	10.4	32.9	13.9
			65.7	54.4	11.4	23.8	14.1
		AVERAGE	65.5	54.5	10.9	30.6	12.6
		STANDARD DEVIATION	0.4	0.2	0.5	6.0	2.3

TABLE E3
TENSILE RESULTS AT $t/2$ LOCATION FOR
ALCOA CU78 (8019) EXTRUSION

COMPANY	TEST TEMP (DEGREES F)	ORIENT-ATION	ULTIMATE STRENGTH (KSI)	YIELD STRENGTH (KSI)	ELONG (%)	RA (%)	E (MSI)		
AIR FORCE	450	LONG	47.1	41.6	7.6	16.6	11.7		
			46.6	42.3	7.2	14.8	9.3		
			46.5	41.9	8.4	20.4	9.6		
ARMY	450	LONG	47.5	41.7	4.2	13.7	9.6		
			45.6	40.2	4.7	15.7	9.2		
			47.2	41.0	7.9	18.0	9.3		
AVERAGE			46.8	41.4	6.7	16.5	9.8		
STANDARD DEVIATION			0.7	0.7	1.8	2.4	1.0		

TABLE E4
TENSILE RESULTS AT $t/2$ LOCATION FOR
ALCOA CU78 (8019) EXTRUSION

COMPANY	TEST TEMP (DEGREES F)	ORIENT-ATION	ULTIMATE STRENGTH (KSI)	YIELD STRENGTH (KSI)	ELONG (%)	RA (%)	E (MSI)
AIR FORCE	450	L TRANS	44.7	39.3	7.5	17.0	10.5
			45.9	44.1	6.8	13.9	16.7
			44.9	39.5	8.0	8.8	12.8
ARMY	450	L TRANS	47.2	40.0	5.0	12.0	10.0
			46.0	36.4	6.4	14.0	8.6
			AVERAGE		39.9	6.7	13.1
STANDARD DEVIATION			1.0	2.8	1.2	3.0	3.2

TABLE E5
TENSILE RESULTS AT $t/2$ LOCATION FOR
ALCOA CU78 (8019) EXTRUSION

COMPANY	TEST TEMP (DEGREES F)	ORIENT-ATION	ULTIMATE STRENGTH (KSI)	YIELD STRENGTH (KSI)	ELONG (%)	RA (%)	E (MSI)		
AIR FORCE	600	LONG	31.3	28.0	10.1	17.1	12.7		
			30.8	28.1	12.5	23.0	7.7		
			31.1	28.1	12.4	17.7	9.0		
ARMY	600	LONG	31.0	28.0	3.9	13.7	8.5		
			29.0		1.9	9.8			
			29.0	25.9	4.5	7.8	6.8		
AVERAGE			30.4	27.6	7.6	14.8	8.9		
STANDARD DEVIATION			1.1	1.0	4.7	5.6	2.3		

TABLE E6
TENSILE RESULTS AT $t/2$ LOCATION FOR
ALCOA CU78 (8019) EXTRUSION

COMPANY	TEST TEMP (DEGREES F)	ORIENT-ATION	ULTIMATE STRENGTH (KSI)	YIELD STRENGTH (KSI)	ELONG (%)	RA (%)	E (MSI)		
AIR FORCE	600	L TRANS	29.8	26.5	10.3	12.4	8.4		
			29.8	25.9	12.9	18.5	11.4		
			30.2	26.4	12.6	16.9	8.7		
ARMY	600	L TRANS	28.9	24.8	2.9	8.0	7.0		
			32.4	27.8	3.0	5.8	10.3		
			29.2	25.1	3.3	7.8	7.8		
AVERAGE			30.1	26.1	7.5	11.6	8.9		
STANDARD DEVIATION			1.2	1.1	4.9	5.2	1.6		

TABLE E7
COMPRESSION RESULTS AT $t/2$ LOCATION FOR
ALCOA CU78 (8019) EXTRUSION

COMPANY	TEST TEMPERATURE (DEGREES F)	ORIENTATION	COMPRESSIVE YIELD STRENGTH (KSI)	COMPRESSIVE MODULUS (MSI)
AIR FORCE	RT	LONG	57.8	
			56.5	12.6
			53.2	13.6
		AVERAGE	55.8	13.1
		STANDARD DEVIATION	2.4	0.7

TABLE E8
COMPRESSION RESULTS AT $t/2$ LOCATION FOR
ALCOA CU78 (8019) EXTRUSION

COMPANY	TEST TEMPERATURE (DEGREES F)	ORIENTATION	COMPRESSIVE YIELD STRENGTH (KSI)	COMPRESSIVE MODULUS (MSI)
AIR FORCE	RT	L TRANS	55.3	14.4
			58.0	14.1
			53.7	
		AVERAGE	55.7	14.2
		STANDARD DEVIATION	2.2	0.2

TABLE E9
COMPRESSION RESULTS AT $t/2$ LOCATION FOR
ALCOA CU78 (8019) EXTRUSION

COMPANY	TEST TEMPERATURE (DEGREES F)	ORIENTATION	COMPRESSIVE YIELD STRENGTH (KSI)	COMPRESSIVE MODULUS (MSI)
AIR FORCE	450	LONG	54.3 49.3 54.8	13.5 12.1
		AVERAGE	52.8	12.8
		STANDARD DEVIATION	3.1	1.0

TABLE E10
COMPRESSION RESULTS AT $t/2$ LOCATION FOR
ALCOA CU78 (8019) EXTRUSION

COMPANY	TEST TEMPERATURE (DEGREES F)	ORIENTATION	COMPRESSIVE YIELD STRENGTH (KSI)	COMPRESSIVE MODULUS (MSI)
AIR FORCE	450	L TRANS	52.0 49.6 51.2	12.1 11.2 11.3
		AVERAGE	50.9	11.6
		STANDARD DEVIATION	1.2	0.5

TABLE E11
 COMPRESSION RESULTS AT $t/2$ LOCATION FOR
 ALCOA CU78 (8019) EXTRUSION

COMPANY	TEST TEMPERATURE (DEGREES F)	ORIENTATION	COMPRESSIVE YIELD STRENGTH (KSI)	COMPRESSIVE MODULUS (MSI)
AIR FORCE	600	LONG	49.9 50.4	11.8 10.0
		AVERAGE	50.2	10.9
		STANDARD DEVIATION	0.4	1.2

TABLE E12
 COMPRESSION RESULTS AT $t/2$ LOCATION FOR
 ALCOA CU78 (8019) EXTRUSION

COMPANY	TEST TEMPERATURE (DEGREES F)	ORIENTATION	COMPRESSIVE YIELD STRENGTH (KSI)	COMPRESSIVE MODULUS (MSI)
AIR FORCE	600	L TRANS	50.7 52.2	9.8 8.4
		AVERAGE	51.5	9.1
		STANDARD DEVIATION	1.0	1.1

TABLE E13
 BEARING RESULTS AT $t/2$ LOCATION FOR
 ALCOA CU78 (8019) EXTRUSION

COMPANY	TEST TEMP (DEG F)	ORIENTATION	e/D	BEARING ULT. STR. (KSI)	BEARING YIELD STR. (KSI)
AIR FORCE	300	LONG	2.0	106.1 103.0 103.3	69.9 83.9 79.6
			AVERAGE	104.1	77.8
			STANDARD DEVIATION	1.7	7.2
AIR FORCE	450	LONG	2.0	85.9 86.2 85.1	69.6 70.9 70.3
			AVERAGE	85.7	70.3
			STANDARD DEVIATION	0.6	0.7
AIR FORCE	600	LONG	2.0	55.1 55.3 55.6	48.5 45.1 45.2
			AVERAGE	55.3	46.3
			STANDARD DEVIATION	0.3	1.9

TABLE E14
 REARING RESULTS AT $t/2$ LOCATION FOR
 ALCOA CU78 (8019) EXTRUSION

COMPANY	TEST TEMP (DEG F)	ORIENTATION	e/D	BEARING ULT. STR. (KSI)	BEARING YIELD STR. (KSI)
AIR FORCE	RT	L TRANS	2.0	126.1 126.7	98.8 99.8
			AVERAGE	126.4	99.3
			STANDARD DEVIATION	0.4	0.7
AIR FORCE	450	L TRANS	2.0	87.5 86.0 86.3	72.7 68.0 72.4
			AVERAGE	86.7	71.0
			STANDARD DEVIATION	1.0	2.6
AIR FORCE	600	L TRANS	2.0	56.2 55.8 56.5	40.9 43.4 43.2
			AVERAGE	56.2	42.5
			STANDARD DEVIATION	0.4	1.4

TABLE E15
FRACTURE TOUGHNESS RESULTS FOR
ALCOA CU78 (8019) EXTRUSION

COMPANY	TEST TEMP (DEG F)	ORIENTATION	KIC (KSI in ^{0.5})	Kq (KSI in ^{0.5})	COMMENT
AIR FORCE	RT	L-T		18.7	(1)
				19.9	(1)
				19.5	(1)
			20.4		
			23.2		
ARMY	RT	L-T		11.0	
			14.6		(2)
		AVERAGE	19.4	17.3	
		STANDARD DEVIATION	4.4	4.2	

(1): INVALID DUE TO EXCESSIVE CRACK FRONT CURVATURE
(2): INVALID DUE TO VIOLATION OF $0.45 < a/W < 0.55$ CRITERIA

TABLE E16
FRACTURE TOUGHNESS RESULTS FOR
ALCOA CU78 (8019) EXTRUSION

COMPANY	TEST TEMP (DEG F)	ORIENTATION	KIC (KSI in ^{0.5})	Kq (KSI in ^{0.5})	COMMENT
AIR FORCE	RT	T-L		11.3	(1)
				12.0	(1)
				11.3	(1)
			10.9		
			12.1		
ARMY	RT	T-L		15.9	(2)
				16.0	(2)
		AVERAGE	11.5	13.3	
		STANDARD DEVIATION	0.8	2.4	

(1): INVALID DUE TO EXCESSIVE CRACK FRONT CURVATURE
(2): INVALID DUE TO $P_{max}/P_q > 1.1$

TABLE E17
 FATIGUE RESULTS WITH R=0.1 AND Kt=1.0 FOR
 ALCOA CU78 (8019) EXTRUSION

COMPANY	TEST TEMP (DEG F)	ORIENTATION	STRESS (KSI)	CYCLES
AIR FORCE	RT	LONG	70.0	1,496
			55.0	82,497
			50.0	86,351
			50.0	323,738
			47.5	1,122,758
			45.0	5,030,776
			40.0	19,715,400
			30.0	21,703,100
			20.0	23,597,900
ARMY	RT	LONG	48.0	60,000
			46.0	118,000
			46.0	330,000
			44.0	148,000
			44.0	81,000
			42.0	17,794,000
			42.0	1,135,000
			40.0	15,328,000

(*): RUN OUT

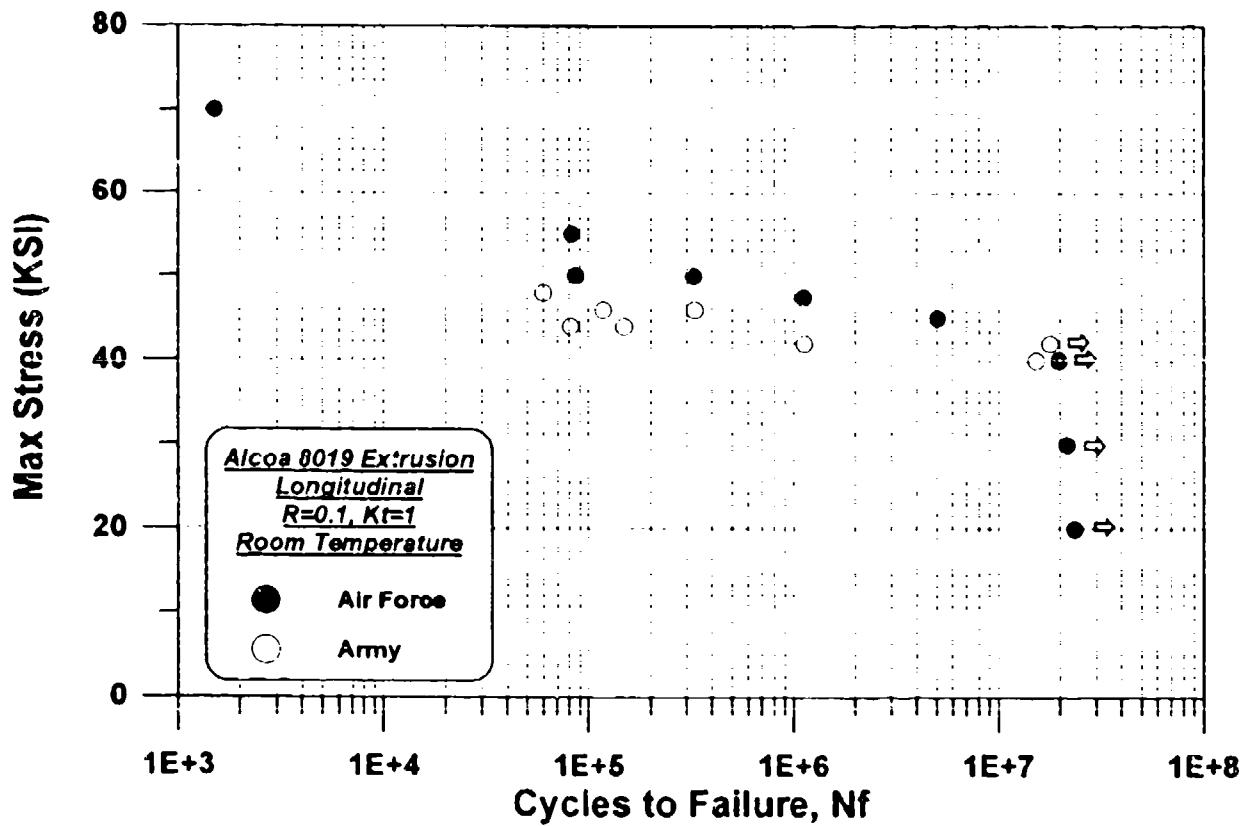


FIGURE E1. FATIGUE RESULTS FOR 8019 EXTRUSION
(LONGITUDINAL, ROOM TEMPERATURE, $K_t=1$)

TABLE E18
 FATIGUE RESULTS WITH $K=0.1$ AND $K_t=1.0$ FOR
 ALCOA CU78 (9019) EXTRUSION

COMPANY	TEST TEMP (DEG F)	ORIENTATION	STRESS (KSI)	CYCLES
AIR FORCE	450	LONG	60.0	2,728
			55.0	41,273
			52.0	136,800
			45.0	59,559
			41.0	923,774
			37.5	4,903,067
			30.0	10,753,363
			20.0	12,096,984
			15.0	14,487,063
ARMY	450	LONG	39.0	181,000
			37.0	105,000
			37.0	67,000
			35.0	361,000
			34.5	1,195,000
			33.5	10,200,000
			32.0	11,598,000
			30.0	10,416,000

(*) : RUN OUT

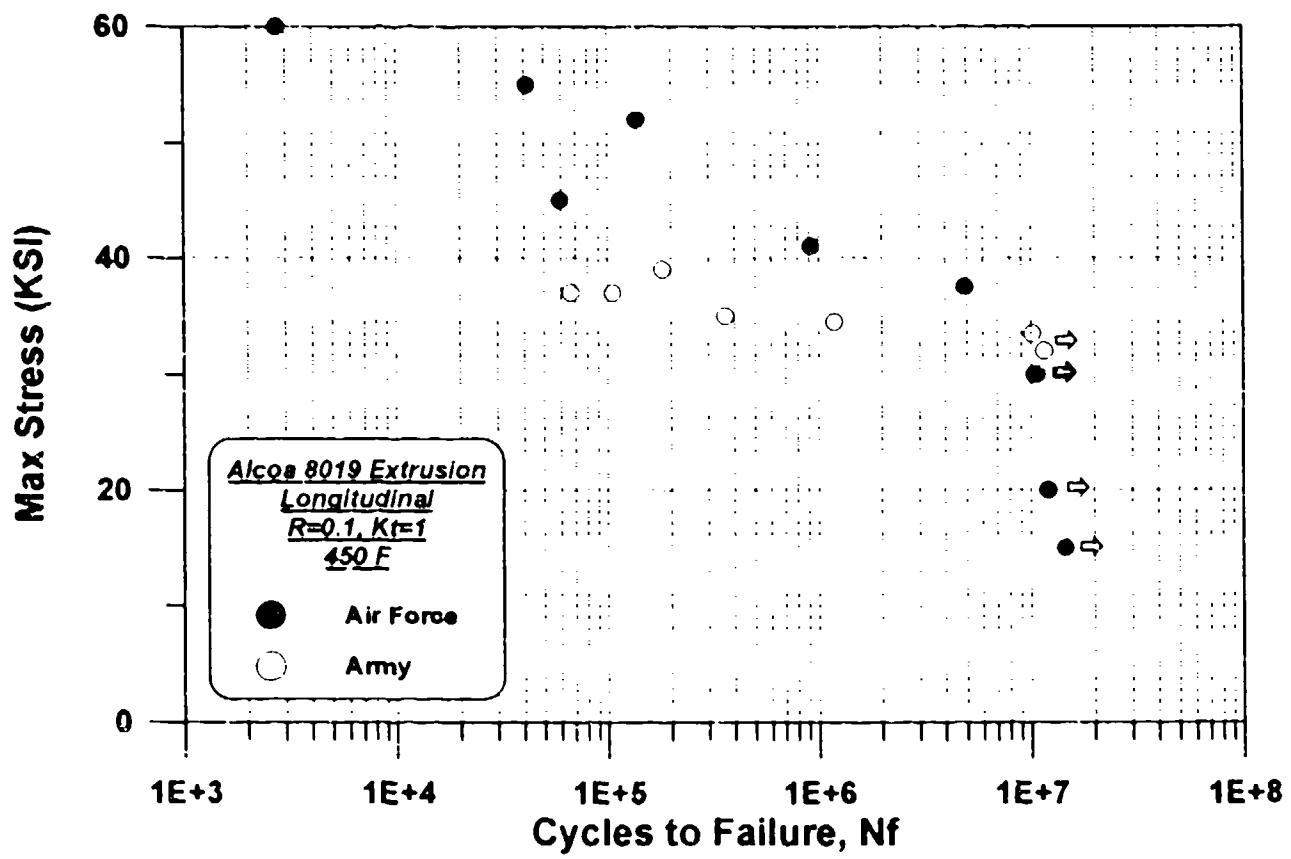


FIGURE E2. FATIGUE RESULTS FOR 8019 EXTRUSION
(LONGITUDINAL, 450 F, Kt=1)

TABLE E19
 FATIGUE RESULTS WITH R=0.1 AND Kt=1.0 FOR
 ALCOA CU78 (8019) EXTRUSION

COMPANY	TEST TEMP (DEG F)	ORIENTATION	STRESS (KSI)	CYCLES
AIR FORCE	600	LONG	42.0	1,927
			37.5	39,386
			32.5	234,943
			30.0	356,575
			27.5	1,340,904
			25.0	12,477,988 *
ARMY	600	LONG	31.5	485,000
			30.2	5,407,000
			29.9	2,318,000
			29.8	2,828,000
			29.5	1,759,000
			28.0	4,469,000
			25.0	13,224,000 *
			23.0	14,969,000 *

(*): RUN OUT

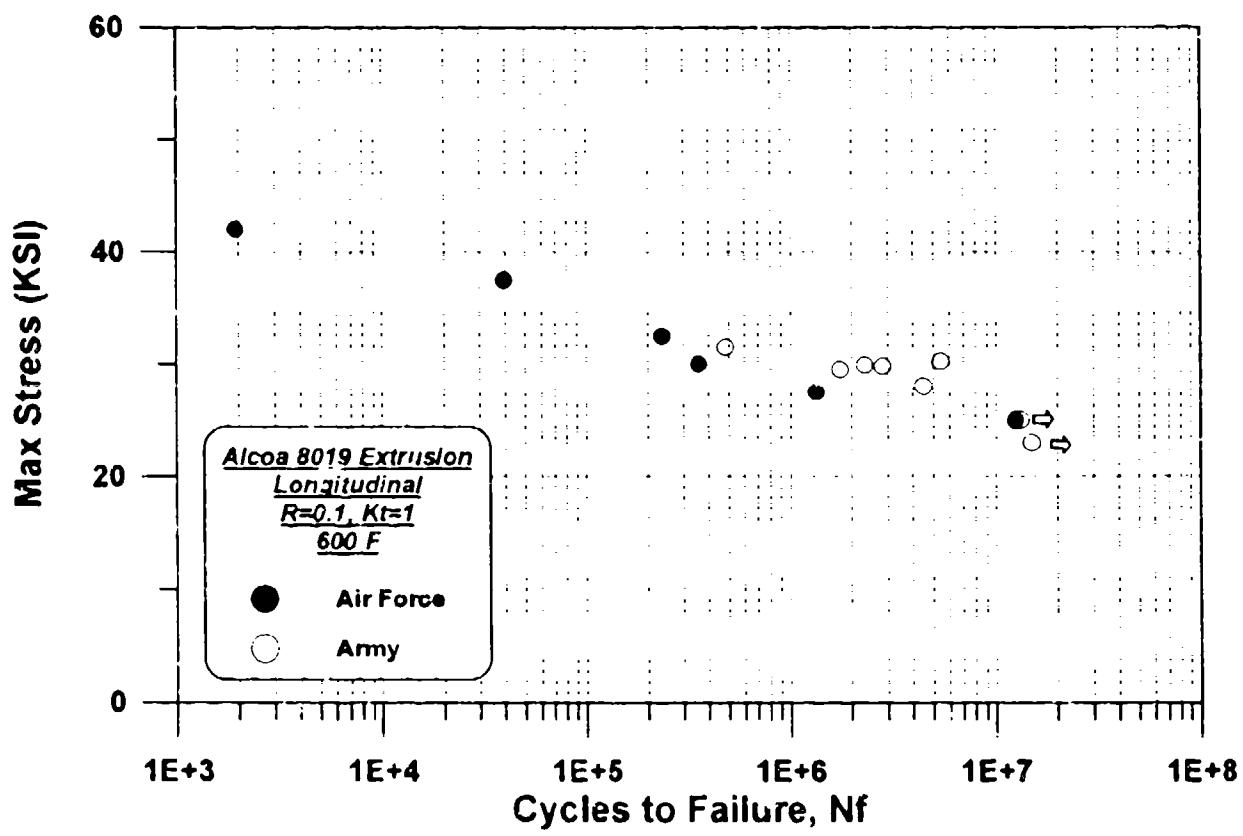


FIGURE E3. FATIGUE RESULTS FOR 8019 EXTRUSION
(LONGITUDINAL, 600 F, $K_t=1$)

TABLE E20
 FATIGUE RESULTS WITH R=0.1 AND Kt=3.0 FOR
 ALCOA CU78 (8019) EXTRUSION

COMPANY	TEST TEMP (DEG F)	ORIENTATION	STRESS (KSI)	CYCLES
AIR FORCE	RT	LONG	30.0	1,482
			15.0	104,042
			12.5	372,059
			11.3	2,333,407
			10.0	10,591,589 *
	450	LONG	25.0	18,349
			21.0	36,495
			14.0	726,152
			12.5	160,808
			10.8	817,495
			10.0	16,827,951 *
	600	LONG	22.0	37,529
			13.0	1,510,601
			12.0	169,140
			11.0	4,266,128
			9.0	11,168,329 *

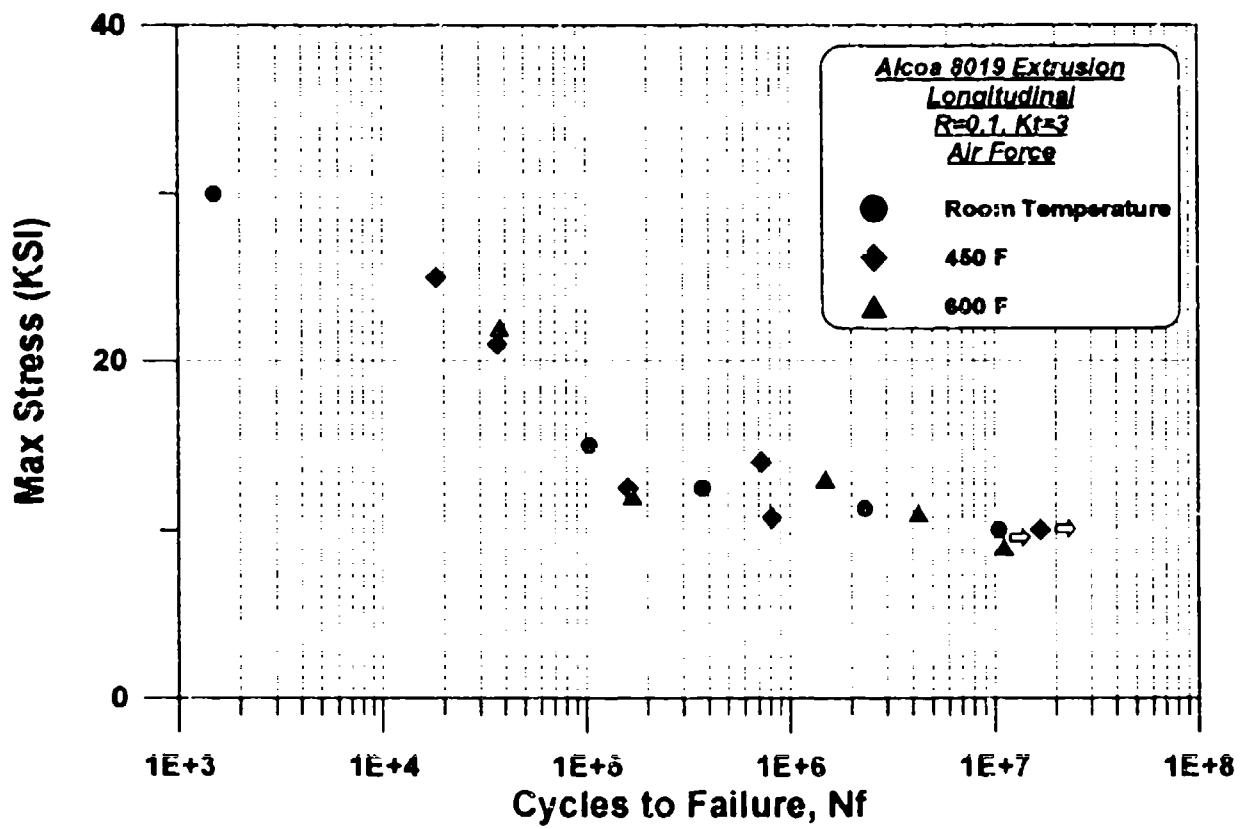


FIGURE E4. FATIGUE RESULTS FOR 8019 EXTRUSION
(LONGITUDINAL, $K_t=3$)

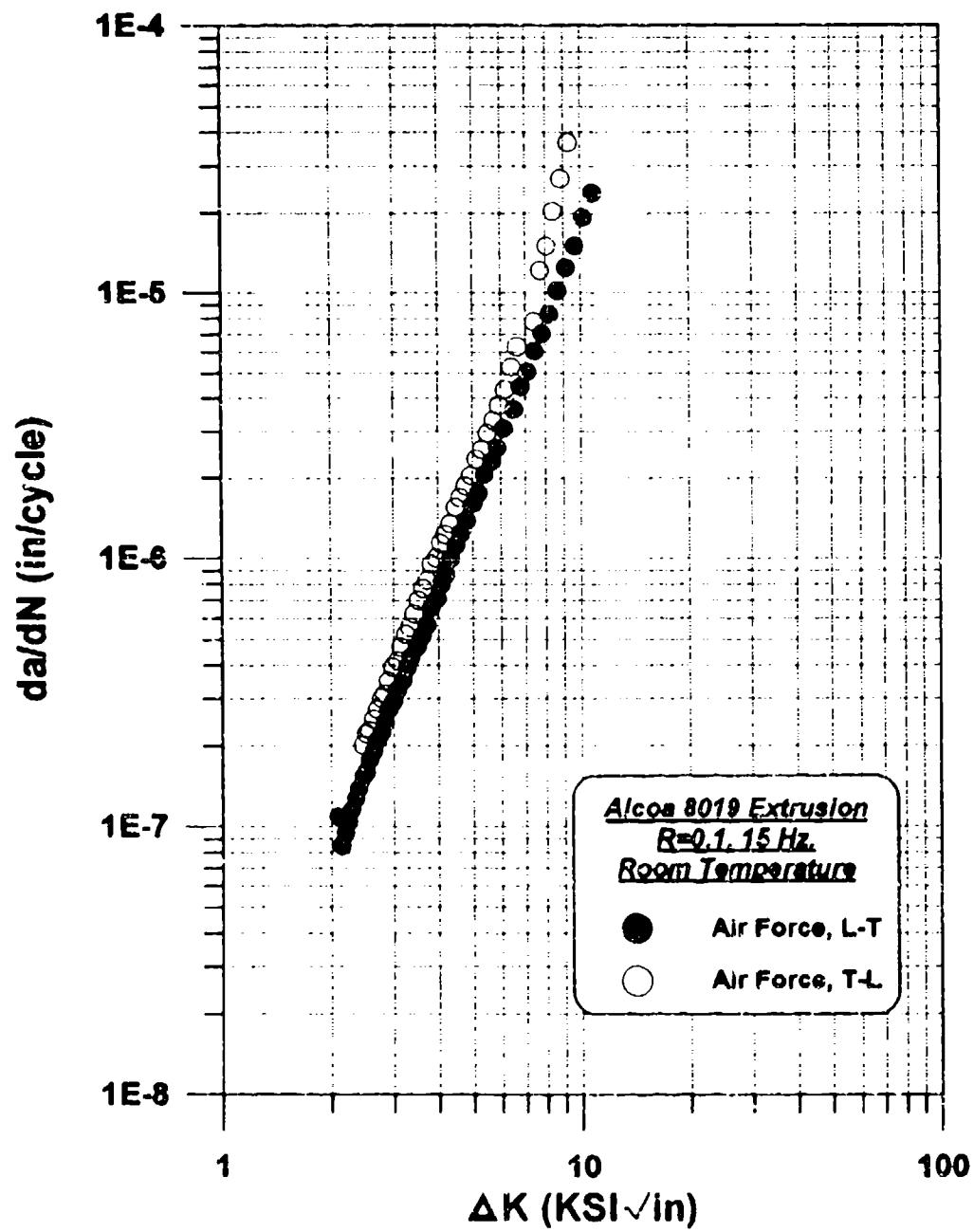


FIGURE E5. FATIGUE CRACK GROWTH RATE RESULTS FOR 8019 EXTRUSION (L-T AND T-L ORIENTATIONS, ROOM TEMPERATURE) AIR FORCE.

Alcoa 8019 Extrusion
 R=0.1
 Air Forces
 Room Temperature

L-T Orientation		T-L Orientation	
Delta K	da/dN	Delta K	da/dN
2.1	1.08E-07	2.45	2.02E-07
2.14	8.48E-08	2.51	2.22E-07
2.19	9.47E-08	2.56	2.28E-07
2.24	1.04E-07	2.63	2.52E-07
2.28	1.16E-07	2.69	2.74E-07
2.34	1.27E-07	2.76	3.02E-07
2.39	1.39E-07	2.83	3.14E-07
2.45	1.53E-07	2.89	3.50E-07
2.51	1.60E-07	2.97	3.95E-07
2.57	1.78E-07	3.07	4.16E-07
2.63	1.91E-07	3.14	4.69E-07
2.7	2.12E-07	3.23	5.21E-07
2.77	2.23E-07	3.32	5.57E-07
2.84	2.45E-07	3.41	6.23E-07
2.91	2.74E-07	3.51	6.99E-07
3	2.95E-07	3.61	7.74E-07
3.06	3.24E-07	3.71	8.30E-07
3.17	3.51E-07	3.82	9.49E-07
3.27	3.94E-07	3.94	9.99E-07
3.35	4.30E-07	4.05	1.14E-06
3.48	4.72E-07	4.19	1.23E-06
3.59	5.13E-07	4.32	1.35E-06
3.71	5.65E-07	4.46	1.55E-06
3.81	6.57E-07	4.61	1.68E-06
3.96	7.08E-07	4.77	1.87E-06
4.07	8.05E-07	4.94	2.05E-06
4.2	8.71E-07	5.11	2.37E-06
4.33	9.97E-07	5.29	2.56E-06
4.48	1.12E-06	5.5	2.96E-06
4.63	1.25E-06	5.7	3.32E-06
4.8	1.38E-06	5.94	3.77E-06
5.01	1.60E-06	6.17	4.33E-06
5.19	1.75E-06	6.41	5.20E-06
5.4	2.07E-06	6.66	6.28E-06
5.63	2.30E-06	7.4	7.80E-06
5.87	2.81E-06	7.72	1.22E-05
6.13	3.08E-06	8.08	1.50E-06
6.51	3.63E-06	8.43	2.03E-06
6.81	4.44E-06	8.86	2.70E-06
7.11	5.04E-06	9.26	3.67E-06
7.44	6.02E-06		
7.82	7.04E-06		
8.21	8.33E-06		
8.65	1.02E-05		
9.14	1.25E-05		
9.65	1.51E-05		
10.22	1.82E-05		
10.83	2.39E-05		

TABLE E21. FATIGUE CRACK GROWTH RATE RESULTS FOR 8019 EXTRUSION
 (L-T AND T-L ORIENTATIONS, ROOM TEMPERATURE) AIR FORCE.

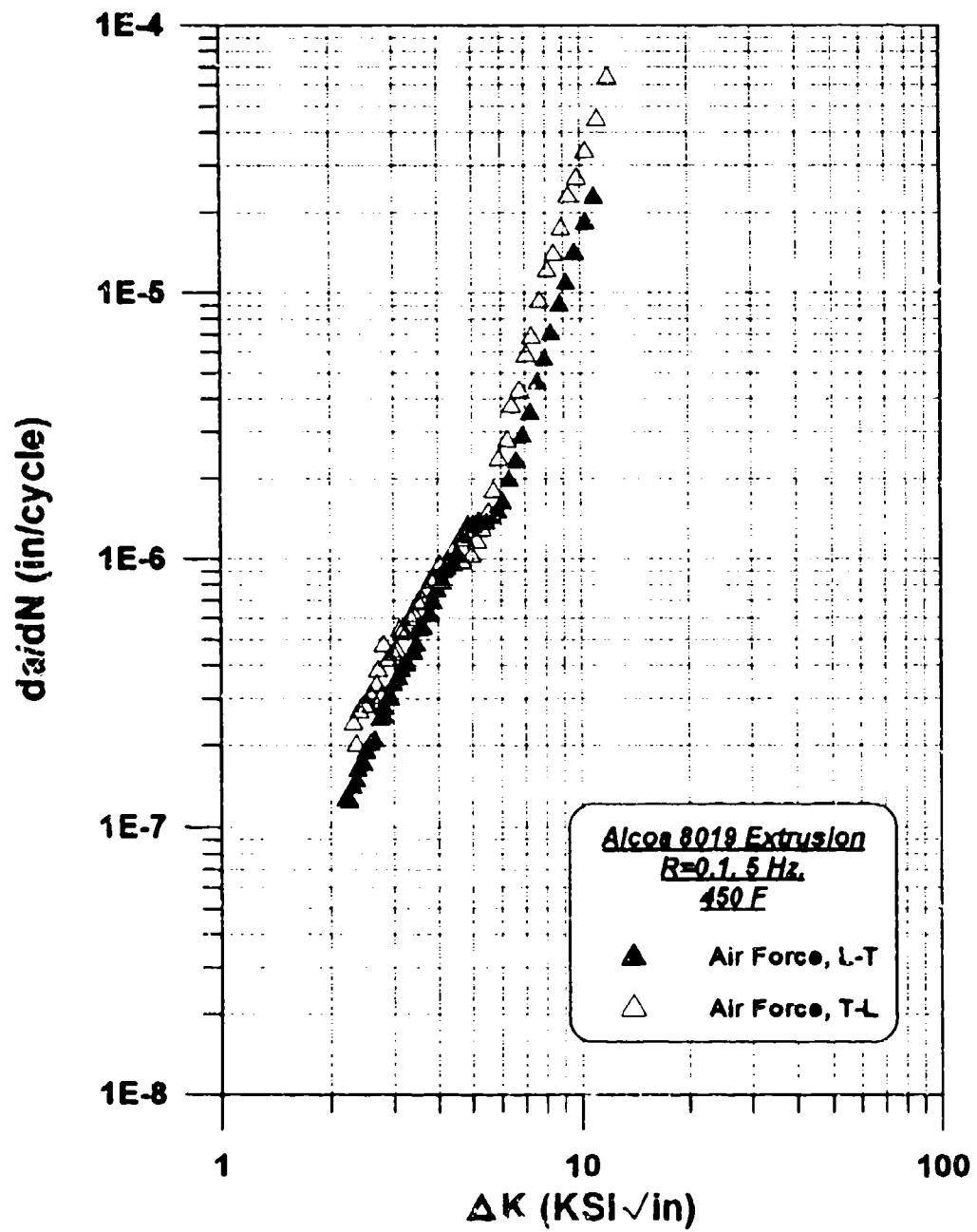


FIGURE E6. FATIGUE CRACK GROWTH RATE RESULTS FOR 8019 EXTRUSION (L-T AND T-L ORIENTATIONS, 450 F) AIR FORCE.

Alcos 8019 Extrusion
 R = 0.1
 Air Force
 450 F

L-T Orientation		T-L Orientation	
Delta K	da/dN	Delta K	da/dN
2.2	1.25E-07	2.32	2.41E-07
2.26	1.23E-07	2.36	2.01E-07
2.31	1.40E-07	2.41	2.67E-07
2.36	1.48E-07	2.48	2.82E-07
2.38	1.61E-07	2.53	2.81E-07
2.47	1.69E-07	2.59	3.04E-07
2.51	1.89E-07	2.68	3.34E-07
2.58	2.02E-07	2.71	3.80E-07
2.65	2.08E-07	2.77	3.00E-07
2.74	2.50E-07	2.81	4.71E-07
2.81	2.75E-07	2.89	4.15E-07
2.82	2.55E-07	2.98	4.39E-07
2.89	2.97E-07	3.05	4.49E-07
2.94	2.97E-07	3.11	5.37E-07
2.99	3.36E-07	3.19	5.32E-07
3.1	3.54E-07	3.28	5.31E-07
3.15	3.79E-07	3.35	5.95E-07
3.27	4.00E-07	3.42	6.11E-07
3.41	4.44E-07	3.52	6.79E-07
3.48	4.75E-07	3.61	6.89E-07
3.55	5.42E-07	3.71	7.54E-07
3.63	5.48E-07	3.81	8.19E-07
3.79	6.12E-07	3.92	8.32E-07
3.86	6.81E-07	4.04	9.35E-07
3.97	7.57E-07	4.15	8.95E-07
4.12	8.13E-07	4.28	9.59E-07
4.24	9.13E-07	4.4	1.06E-06
4.42	9.57E-07	4.55	1.02E-06
4.52	1.03E-06	4.67	9.71E-07
4.69	1.21E-06	4.77	1.18E-06
4.85	1.32E-06	4.97	1.02E-06
5.03	1.33E-06	5.15	1.15E-06
5.21	1.38E-06	5.31	1.28E-06
5.46	1.36E-06	5.53	1.49E-06
5.66	1.43E-06	5.7	1.79E-06
5.88	1.49E-06	5.92	2.35E-06
6.08	1.62E-06	6.25	2.77E-06
6.32	1.96E-06	6.43	3.72E-06
6.64	2.32E-06	6.75	4.25E-06
6.89	2.87E-06	7.06	5.79E-06
7.24	3.50E-06	7.31	6.77E-06
7.58	4.53E-06	7.71	9.21E-06
7.95	5.59E-06	8.09	1.21E-05
8.3	7.00E-06	8.46	1.39E-05
8.78	8.92E-06	8.9	1.73E-05
9.16	1.06E-05	9.29	2.29E-05
9.65	1.41E-05	9.81	2.67E-05
10.35	1.92E-05	10.37	3.37E-05
10.85	2.27E-05	11.16	4.44E-05
		11.98	6.36E-05

TABLE E22. FATIGUE CRACK GROWTH RATE RESULTS FOR 8019 EXTRUSION
 (L-T AND T-L ORIENTATIONS, 450 F) AIR FORCE.

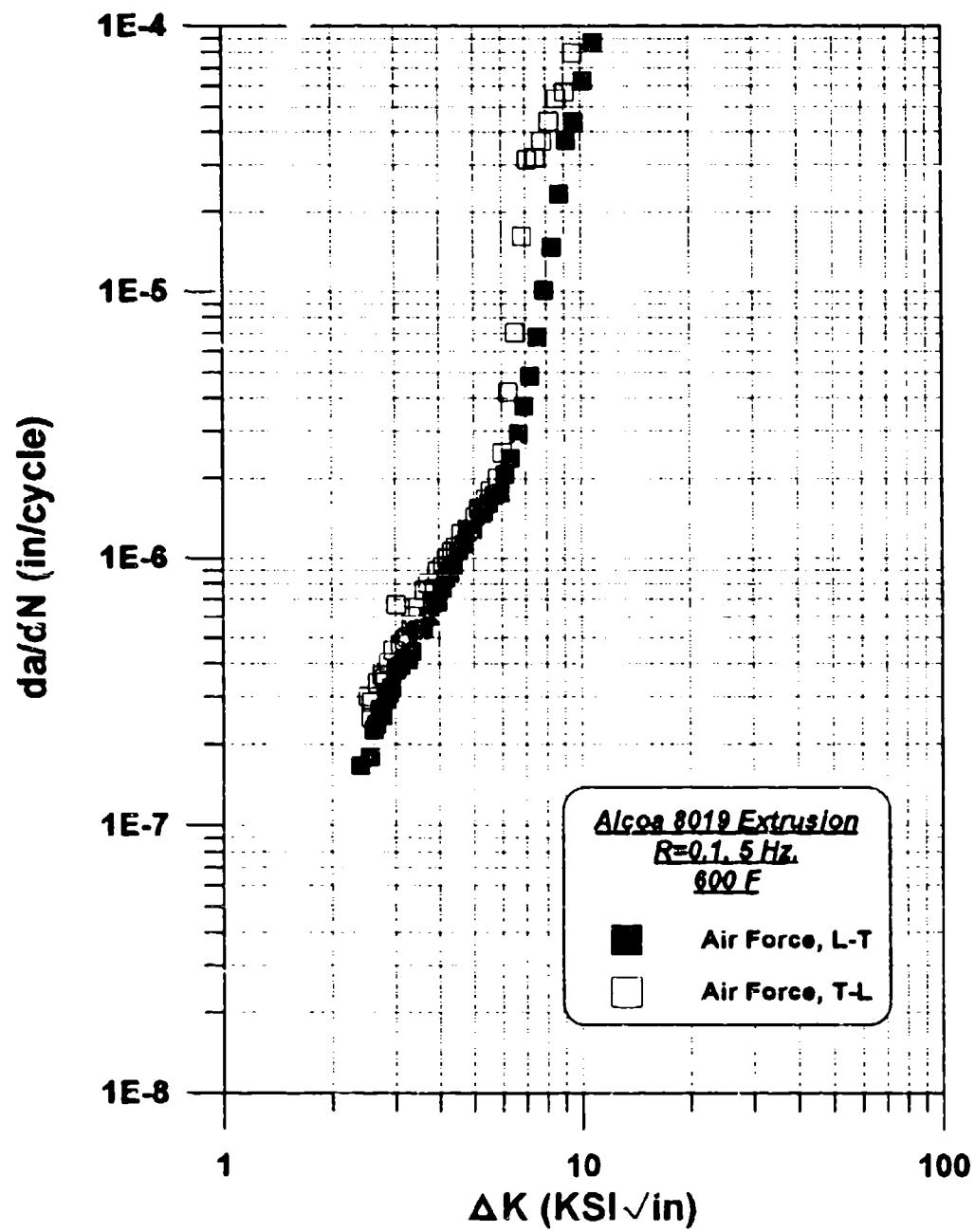


FIGURE E7. FATIGUE CRACK GROWTH RATE RESULTS FOR 8019 EXTRUSION
(L-T AND T-L ORIENTATIONS, 600 F) AIR FORCE.

Alcoa 8019 Extrusion
 R=0.1
 Air Force
 600 F

L-T Orientation		T-L Orientation	
Delta K	da/dN	Delta K	da/dN
2.4	1.67E-07	2.52	3.02E-07
2.55	1.80E-07	2.57	2.53E-07
2.62	2.27E-07	2.58	2.87E-07
2.66	2.37E-07	2.68	3.40E-07
2.72	2.71E-07	2.75	3.63E-07
2.77	2.56E-07	2.81	3.53E-07
2.84	2.95E-07	2.87	4.02E-07
2.88	3.11E-07	2.96	4.49E-07
2.93	3.25E-07	3.02	6.67E-07
3.02	3.78E-07	3.1	4.73E-07
3.1	3.92E-07	3.18	4.92E-07
3.2	4.18E-07	3.23	5.04E-07
3.26	4.15E-07	3.32	5.65E-07
3.35	4.43E-07	3.39	6.04E-07
3.45	5.32E-07	3.46	6.55E-07
3.52	5.36E-07	3.62	7.57E-07
3.6	5.45E-07	3.71	8.06E-07
3.73	6.03E-07	3.88	7.65E-07
3.82	6.76E-07	3.95	8.95E-07
3.95	6.84E-07	4.08	9.35E-07
4.06	7.72E-07	4.2	1.00E-06
4.15	8.36E-07	4.33	1.06E-06
4.28	8.82E-07	4.43	1.10E-06
4.37	9.31E-07	4.58	1.23E-06
4.51	1.07E-06	4.78	1.29E-06
4.67	1.13E-06	4.87	1.29E-06
4.79	1.25E-06	5.04	1.43E-06
4.98	1.28E-06	5.24	1.47E-06
5.15	1.55E-06	5.41	1.67E-06
5.34	1.51E-06	5.58	1.80E-06
5.51	1.61E-06	5.84	2.01E-06
5.72	1.73E-06	6.03	2.51E-06
5.93	1.76E-06	6.25	4.21E-06
6.15	2.09E-06	6.53	7.03E-06
6.36	2.37E-06	6.85	1.62E-05
6.67	2.95E-06	7.1	3.15E-05
6.93	3.72E-06	7.5	3.20E-05
7.22	4.83E-06	7.81	3.69E-05
7.57	6.80E-06	8.21	4.39E-05
7.91	1.01E-05	8.57	5.36E-05
8.32	1.48E-05	9.06	5.67E-05
8.72	2.33E-05	9.56	7.95E-05
9.11	3.71E-05		
9.58	4.37E-05		
10.22	6.26E-05		
10.88	8.71E-05		

TABLE E23. FATIGUE CRACK GROWTH RATE RESULTS FOR 8019 EXTRUSION
 (L-T AND T-L ORIENTATIONS, 600 F) AIR FORCE.